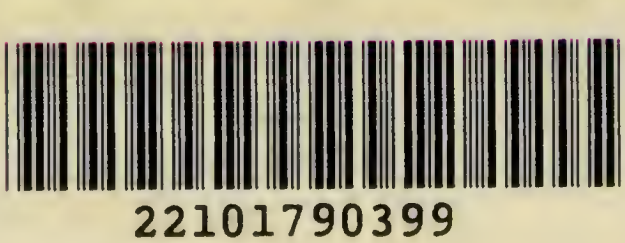
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A Handbook on Surgery

INTENDED FOR

DENTAL AND JUNIOR MEDICAL STUDENTS

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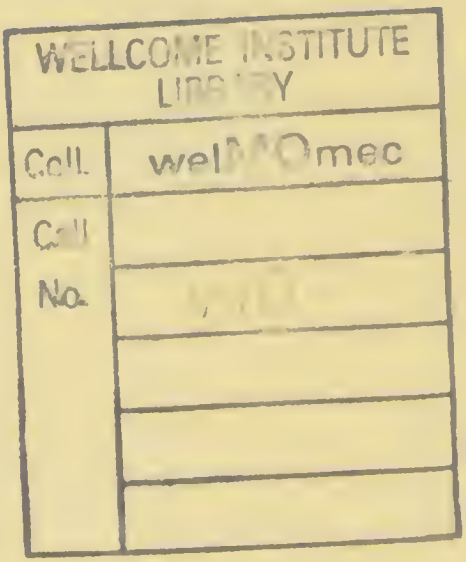
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PREFACE.

The authors of the present handbook have long felt that, considering the circumscribed field of general surgery that is required of dental students by the licensing bodies, the existing textbooks should be supplemented by one treating this subject from the point of view of the requirements of the examinations for the dental licence. They have also hoped that a clearly-written elementary treatise might not be unwelcomed by the general student as an introduction to the study of Surgery. Ten years' experience as an examiner on the English board seemed a fitting qualification for the preparation of such a work, and a visit of inspection as emissary of the General Medical Council to all the existing British examinations has, it is hoped, prevented a narrow or local purview of the subject. The important question of Anæsthesia has been entirely omitted for the sufficient reason that most excellent and accessible handbooks dealing with this subject have already been written by professed experts.

Free use has been made of current standard textbooks, and the authors wish to express their indebtedness most particularly to the authors of "Rose and Carless's Surgery," "Thomson and Miles's Surgery," and "Waring's Operative Surgery."

A. S. U.,
A. B. G. U.

26, *Wimpole Street, W.*

ERRATUM.

P. 71, line 15, *for* "means of sterilized milk" *read* "means of sterilized silk."

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SURGERY FOR DENTAL AND JUNIOR MEDICAL STUDENTS.

CHAPTER I.

BACTERIOLOGY.

As an introduction to the study of surgery, some acquaintance with the nature and behaviour of bacteria is of great importance. Practically the whole of modern surgical treatment, and, to a great extent, diagnosis, rests upon a knowledge of the bacterial processes involved.

Bacteria or **Schizomycetes** are a group of unicellular organisms containing no chlorophyll and reproducing themselves in most cases by simple fission. They vary considerably in shape and size, some being as small as .5 μ in diameter, that is, about one-fifteenth the size of a red blood corpuscle; while others may be 6 or 7 μ in length. They are rarely larger than the diameter of a red blood cell (7.5 μ). Some are possessed of thread-like processes, called flagella, by the vibration of which they are enabled to move about.

Many a stern battle has been waged over the question as to whether these organisms should be classed as animal or vegetable; at the present moment their position as plants of the class fungi seems to be secure.

Reproduction takes place in two ways, both of which are entirely asexual. The first, and by far the most common, method is simple fission. A constriction appears at about the middle of the organism and gradually increases in depth until the cell becomes completely divided into two. No more complicated method of division such as karyokinesis has been described among this class.

The second method of reproduction is by formation of spores. This is only found in a few forms, notably

in the organisms of tetanus, anthrax, and malignant œdema. At first, little, highly refractile granules, often described as "like oily-looking droplets," make their appearance in the protoplasm of the organism. These granules join, or rather flow together to form one large granule, which is the spore. The fully formed spore consists of protoplasm, rather poorer in water than normal protoplasm, surrounded by a thick cell-wall. Spores are very much more resistant than the bacteria from which they arise; indeed, they are specially adapted to preserve the species under conditions which to the less resistant bacteria would prove fatal.

An extremely large number of species has been described at one time or another, but, fortunately for the student, comparatively few are of surgical importance.



FIG. 1.—Streptococci.



FIG. 2.—Diplococci.

Bacteria are divided, according to their shape, into three great classes.

(1) **Cocci.**—These organisms are spherical in shape, or nearly so; they reproduce by simple fission; sporulation has not been shewn in this group. They are roughly classified according to their mode of division:—

(*a*) Those which divide in one axis only, forming a chain of cocci, like a series of golf-balls in a row, are called *Streptococci.*

(*b*) Some arrange themselves in pairs, these are called *Diplococci.* The pneumococcus, which is a frequent cause of pneumonia, belongs to this group. Diplococci are often also arranged in chains.

(*c*) Those which divide in two axes at right-angles

to one another, forming sets of four cocci, like four golf-balls all touching, are called *Tetracocci* or *Tetrads*. In rare cases sets of sixteen are formed.

(*d*) Those which divide in three axes at right-angles to one another, form sets of eight cocci arranged in a cube; these are called *Sarcinæ*. The cocci are often not completely divided from one another, so that the masses of eight look like bales of wool tied in three directions.

(*e*) Those which divide irregularly in various axes



FIG. 3.—Tetracocci.

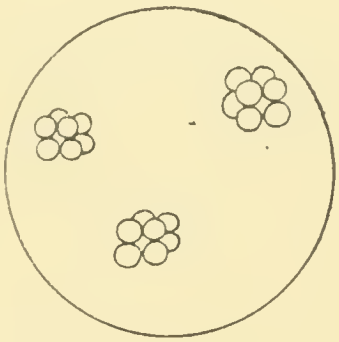


FIG. 4.—Sarcinæ.

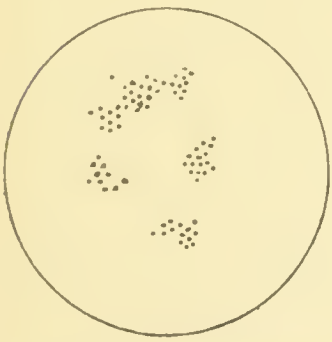


FIG. 5.—Staphylococci.



FIG. 6.—Bacilli.

result in irregular masses, like bunches of grapes, and are called *Staphylococci*.

(2) **Bacilli**, or rod-shaped organisms, vary greatly in length. Their extremities may be sharp or rounded. Some possess flagella, in varying numbers, in which case they are motile. Reproduction is by simple fission, and also in certain members of the group by sporulation.

(3) **Spirilla**, or curved organisms, vary very much,

some being quite short with only one curve, often described as comma-shaped, *e.g.*, cholera organism. Others are much longer and more slender, with several curves. These latter may be motile without the aid of flagella, moving by a waving motion of their bodies, but many of the group also possess flagella. Reproduction is mainly by simple fission; sporulation has been described in certain forms.

The names *Spirochæte* and *Vibrio* have been used, as well as *Spirillum*, in describing members of this group; but as various authorities use these terms with varying significance, it has seemed wiser for our purpose to include the whole group under the name Spirilla.

Of these three classes, the first two are of far the greater importance to surgeons, and it will be



FIG. 7.—Spirilla.

necessary to discuss them rather more in detail when we come to study the diseases for which they are responsible.

Bacteria may also be classified according to their method of obtaining nitrogenous food; into (*a*) *Parasites*, organisms which can only feed on living animal or vegetable matter, and (*b*) *Saprophytes*, organisms which obtain their pabulum from dead or decaying animal or vegetable matter. In between these classes are forms which prefer living food but can manage to exist on dead, and *vice versâ*.

Another important feature in which bacteria differ from one another is their behaviour towards oxygen. Certain forms, classed together as *anaerobes*, are unable to live in the presence of oxygen, while others, *aerobes*,

cannot exist without it. Again, there are forms which take up an intermediate position, favouring one or other condition but able to get along under either. These are termed *facultative* aerobes, or anaerobes, as the case may be.

Bacteria are almost unanimous in their dislike to sunshine, though the dislike is of varying intensity. For instance, the bacillus of tuberculosis is killed in a very short time if exposed to direct sunlight, while even ordinary London daylight is fatal, though in rather longer time.

Temperature also has important bearing on their activity, again in varying degree. The temperature most favourable to their growth is known as the *optimum temperature*; it varies slightly with different forms, but is usually about 37° C., that is, about the normal temperature of the human body. Though most bacterial growth is inhibited at or below 10° C., the organisms are not destroyed by extreme cold. Some have been found to be alive and apparently happy when, after an exposure for ten hours to a temperature of —250° C., they have been again placed at their optimum temperature.

A much greater effect is brought about by the application of heat. Bacterial growth usually ceases at about 40° C., and most non-sporing forms are destroyed at 65° C. Some spores may survive if boiled for a short time, but prolonged boiling will destroy them.

This action of heat upon bacteria and their spores is of very great practical importance to the surgeon, whatever his speciality, and we shall speak of it again when we discuss the principles of asepsis.

Certain chemical substances also affect these organisms, either inhibiting their growth or killing them outright. These substances assume great importance in surgery under the title of *Antiseptics*, or *Germicides*, among which may be mentioned phenol (carbolic acid), mercuric chloride, iodine, alcohol, &c.

There are a few micro-organisms, pathogenic in man, which do not belong to the class of bacteria:—

(1) The **Yeasts** or **Blastomycetes**, which again are unicellular fungi, so rarely cause disease in man that we need not consider them further.

(2) The **Hyphomycetes** compose another group of

fungi. They are multi-cellular, and form filamentous networks, often very complicated. A few of these require notice, *viz.*: *Oïdium albicans*, the cause of thrush; *Microsporon Audouini* and *Trichophyton*, both of which are causes of ringworm; and a series of organisms grouped under the name *Streptothrix*, to which the disease known as *Actinomycosis* is due.

(3) Among the **Protozoa**, or unicellular animals, are the parasite to which malaria is due, and *Spirochæta pallida*, which is the organism of syphilis.

Certain of these micro-organisms, when they gain access to the human body, produce a series of phenomena which we call disease. These are known as *pathogenic* organisms, and it is with these that we are chiefly concerned; on the other hand, there are some which appear to produce no effect, while others are actually beneficial. Some may be normally quite harmless, but under certain circumstances become pathogenic.

It is necessary to inquire what are the effects produced by the invasion of the body by pathogenic organisms.

These effects are of three kinds. First, there may be a "local lesion"—that is, a change produced in the tissues in the neighbourhood of the invading organism, which change may be acute or chronic. Examples of acute local lesions are the membrane formed in the throat in diphtheria, or the ulceration of the intestine in typhoid fever; and of chronic local lesions, tuberculous or syphilitic ulceration.

Secondly, tissue changes may occur in organs or parts of the body remote from the neighbourhood of the bacteria. These are due to the absorption into the blood of certain substances, known as *toxins* (poisons), manufactured by the bacteria, and carried to various parts of the body by the blood-stream. These toxins are of two kinds: extra-cellular and intra-cellular. The *extra-cellular* toxins are substances which are found in the fluid in which the organisms which form them are grown, and by injecting this fluid into susceptible animals toxic effects can be produced. The chief organisms which form extra-cellular toxins are *B. diphtheriæ* and *B. tetani*.

Intra-cellular toxins, on the other hand, do not occur

in the fluid in which the bacteria are grown, and cannot be produced under experimental conditions. That they are formed in the human body to which the bacteria have gained access we have ample evidence in the effects produced by them, examples of which will be found in the following paragraph.

Thirdly, there are general disturbances of metabolism, such as fever, wasting, &c. These effects again are the work of the toxins.

As regards the chemical nature of toxins, the little that is known shews them to be of such complexity, that to discuss the question in a handbook of this size is quite undesirable.

In the foregoing pages an attempt has been made very briefly to describe the vast army to whose attacks the great bulk of disease is due. Their energies are, of course, directed towards their own successful proliferation and continued existence; and this goal cannot be attained except at the price of the injury or death, piecemeal or entire, of the "host."

We must now try and see what measures the human organism employs to defend itself against this invasion. Before doing this, there are a few terms in constant use that need some explanation.

Infection has been defined as "the access of living, virulent, pathogenic organisms to a region from whence their toxins may act on the tissues of the body." All the conditions mentioned in this definition must be fulfilled before infection may be said to have occurred. First, the organisms must be living. Dead bacteria can in some cases produce deleterious effects, but this is not "infection." Organisms of the same species vary considerably, from different causes, in their power of doing harm. Some may have so little power that they produce no effect whatever. These, though pathogenic, are not *virulent*, and therefore do not cause infection. That the organisms must be pathogenic is obvious from our definition of the word pathogenic. Lastly, they must be in such a position that their toxins can act on the tissues. It is quite possible, for instance, for "living, virulent pneumococci" to be present in the mouth of a healthy person without producing ill effects. This does not constitute infection.

Infection may be either local or general. *Local* in-

fection is that which occurs at the point where the micro-organisms gain access to the body. The hard chancre of syphilis is an example.

General infection occurs when the organisms gain access to the blood-stream, grow and multiply there, and so produce general symptoms. An organism, once in the blood-stream, is liable to be carried to any part of the body. The secondary stage of syphilis is an example.

In most local infections there is also general infection to a greater or less extent, while it is rare for a general infection to be present without some local manifestation. As an example of this, we may again quote diphtheria, in which the local lesion in the throat is almost invariably accompanied by general symptoms, usually very marked.

"Living, virulent, pathogenic bacteria" are present in myriads all around us. Our chance of escaping the attentions of some at least of these enemies would be slender, indeed, were we not provided with a natural means of defence against them. This natural means of defence is known as **Immunity.** The subject of immunity is very complicated and by no means fully understood at the present time, so that it is impossible in the space at our command to say more than a few words upon it.

Immunity may be *natural* or *acquired*. Natural immunity is the power of resisting disease inherent in the animal at birth. It varies within very wide limits in different classes of animals, in different races of human beings, in different individuals of the same race, and even in the same individual when exposed to varying environment.

This latter point may be better understood by means of an example. If we sit in a draught we are liable to "catch a cold." This so-called "cold" is due to the direct influence of certain bacteria. These bacteria are frequently present in our mouths and respiratory tracts even when we are perfectly well; but our natural immunity is more than sufficient to prevent any unpleasant manifestation of their presence. Then we sit in the draught. This in some way lowers the natural resistance of the body, and so the micro-organisms, powerless before to cause any harm, when

the defensive army was strong and healthy, are able, against the weakened opposition, to bring about those changes in the body that we call a "cold."

Many other factors may tend to lower the natural resisting power, such as starvation, overcrowding, wasting disease (*e.g.*, Diabetes mellitus), or the action of poisons (*e.g.*, alcohol, &c.).

Acquired immunity may be of two kinds: *active* and *passive*. Active immunity to a disease is the increased resistance produced by a previous attack of that disease. Passive immunity is produced by the injection into the animal of some artificially prepared substance by which immunity is conferred.

Natural immunity is chiefly due to the activity of the white blood corpuscles. These act mainly in two ways. First, they actually ingest and destroy foreign bodies present in the blood-stream. Secondly, some bactericidal substances are formed by the leucocytes in the tissues, and by these bacteria are destroyed. When any injury to the tissues takes place, rendering the possibility of an attack from outside easier, there is at once a great concentration of leucocytes towards the spot to repel the invasion.

Various names have been given to these bactericidal substances, and many theories as to their exact origin have been promulgated. It will be sufficient for our purpose if we remember that we possess an army of leucocytes, whose function it is to wage war with our bacterial enemies; and that, whether a disease ends in recovery or no, depends upon the relative strengths of invader and invaded.

Acquired immunity needs a little further explanation. After an invasion of bacteria has been successfully repelled, the patient will be found to have developed a greater resistance towards the particular disease, *i.e.*, to the activity of the particular organism, than he possessed before the attack. This is due to the fact that substances, known as *antibodies*, have been formed in the patient's blood, which are capable of rendering harmless the various toxic substances by means of which bacteria produce their deleterious effect. This is *active acquired immunity*. If the serum of such a patient containing these antibodies be injected into the blood of another animal, a certain amount of im-

munity will be conferred upon this second animal by virtue of the antibodies injected. This is *passive acquired immunity*.

Working on this principle, a serum can be artificially prepared in the case of certain diseases, which serum, when injected in proper dose and at the proper time into a patient suffering from the particular disease, may so increase his power of resistance to that disease, that he will be enabled to recover from an attack from which his own natural immunity would have been powerless to preserve him.

Notably is this the case in diphtheria, and in tetanus; and a glance at the figures showing the death-rate from diphtheria before and after the introduction of the "Diphtheria antitoxin" will amply suffice to show the immense value of this treatment.

There is another method by which immunity may be conferred—*viz.*, **Vaccination,** to which brief allusion must be made.

Vaccination consists in the injection into the patient of a "vaccine" containing the living organisms of the particular disease involved, the organisms being in a state of diminished virulence. Dead cultures of the organisms are also used in certain cases. If the particular organism by which the patient is attacked can be isolated, the vaccine can be prepared from this organism. The methods of preparation of vaccines are too complicated to find a place in a manual of this size.

The immunity conferred by this method is comparable to that which follows a previous attack of the disease, and is therefore classed as *active acquired immunity*.

It is a fascinating subject, but space has forbidden us to do more than dip into it. But our readers may be sure that a more extensive study in the many text-books which deal fully with the subject will more than repay them, both in interest and practical value.

CHAPTER II.

ASEPSIS AND ANTISEPSIS.

From the study of Bacteria and their action upon the human body, we proceed naturally to the consideration of the principles of asepsis and antisepsis, by which the whole system of modern surgical technique is governed. First, to define the meaning of the words, which will perhaps best be done by means of an example. Suppose we have a pair of dressing forceps. We boil them in water for fifteen minutes. All pathogenic micro-organic life which might have been present on these forceps before we began is now, as far as we can tell, effectually destroyed. The forceps are now said to be *aseptic*, that is, free from micro-organisms. But again, suppose we lay them down on a table, exposed to the air and dust, there is nothing to prevent other bacteria finding their way on to the forceps again. In order to meet this difficulty, we lay them down, not on a table but in a dish containing a 1 in 20 solution of carbolic acid, in which solution bacteria cannot live. The forceps are now both *aseptic* and *antiseptic*, that is, free from bacteria, and in such a position that no other bacteria can reach them alive.

When a wound has been made in the skin or mucous membrane, either by accidental injury or by the surgeon's knife, the main factor in delaying or preventing healing is infection by micro-organisms, chiefly those known as pyogenic organisms (*e.g.*, *Streptococcus* and *Staphylococcus pyogenes*). The object of the surgeon is, if possible, to prevent altogether the entrance of micro-organisms into the wound, or at least to limit the number to such an extent that the patient's natural defences are sufficient to cope with them. In the case of an operation wound, or a wound made with a sharp, clean instrument such as a razor, this task may be comparatively simple. In the case of an injury caused by a blunt, dirty instrument (*e.g.*, a kick from a boot) it is of course impossible. Infection

having once occurred, the surgeon's energies are directed towards removing or destroying as far as possible the micro-organisms that have gained entrance, preventing any further reinforcement of the invaders, and keeping up the patient's general strength so that his army of leucocytes may be in best possible fighting trim to deal with the invasion that has already occurred.

Neither asepsis nor antisepsis is sufficient by itself. In order that the best possible results may be obtained, a combination of the two is required.

Perhaps the best way of shewing the various sources of infection to which an operation wound is liable, and the methods used to prevent it, will be to describe in a little detail the performance of an operation.

Suppose we have to deal with a patient who six months ago had an acute attack of appendicitis, from which he recovered without operation. He is now apparently perfectly well; but, for fear of a second attack, is advised to have his appendix removed. A case like this has been selected because it is one in which there is little or no chance of infection, if aseptic principles are strictly obeyed. There is no acute disease going on, there has been no external wound through which infection might have entered, and the patient's general health is at its best.

The chief points of danger from the point of view of infection are the hands, arms, and breath of the operator and assistants, the instruments used in the operation, and the skin of the patient.

Scrupulous cleanliness must be observed in the preparation of the room in which the operation is to take place. In a hospital this is of course easy; in a private house it may be extremely difficult. In the latter case, all carpets and unnecessary furniture should be removed, and the walls, &c., well scrubbed, preferably with an antiseptic lotion, such as perchloride of mercury 1 in 1,000.

The preparation of the patient's skin should be commenced at least the day before operation, while some surgeons begin two days before. The person who is to perform this preparation, usually a dresser, begins by thoroughly cleaning his own hands. He then proceeds to shave with a razor the whole "area of

operation." In the case we are describing, this would include the whole of the front of the abdomen, the pubes and scrotum, and the upper part of the front of the thighs. The whole area is then scrubbed with soap and water and a nail-brush (the latter having been previously boiled). The scrubbing should occupy at least ten minutes to a quarter of an hour. Particular care is necessary in dealing with the umbilicus. The soap is washed off with some antiseptic lotion, carbolic 1 in 40 or perchloride 1 in 1,000, according to the fancy of the surgeon. The skin is now well rubbed with ether to remove all greasy material.

Up to this point, the hands of the dresser have only been clean in the ordinary society sense of the word. He must now render his hands *surgically clean*, a very different condition indeed. This process of "cleaning up" is described later on, when the surgeon prepares his hands before operating (p. 16), so we need not mention it here except to say that the process should be gone through every bit as thoroughly and conscientiously in the preparation of the patient as in the actual operation (except that rubber gloves, overalls, &c., are not usually worn in the former case).

The dresser now being surgically clean must not touch anything which is not in a like condition, so will need an assistant to hand him any bowls, &c., which he may require. He first rubs the part well with methylated spirit, followed by swabbing with carbolic lotion 1 in 40. The prepared part is now surgically clean; but it has to be kept so until the next day. To effect this, a large piece of sterilized lint is wrung out in 1 in 40 carbolic lotion, and placed over the part. It must completely cover the area prepared. This in its turn is covered with some protective glazed paper, and the whole firmly bandaged. The process is repeated in its entirety on the morning of the operation. The success of the surgeon's endeavour to maintain asepsis depends very largely upon the care with which the preparation is carried out by his subordinates, and the slightest carelessness may be followed by very grave results.

Another process by which the field of operation may be rendered surgically clean has become very popular during the last two or three years, under the name of

the **Iodine Method.** When first introduced it was customary to shave and scrub the patient just as already described, only using the iodine as an additional precaution. It was found, however, that if this were done, the iodine did not penetrate the skin to any extent, and the results obtained were consequently unfavourable. Practice has shown that in order to obtain the best results the iodine solution must be painted on *without any previous treatment of the part with soap or razor.* (Some surgeons prefer the part to be shaved, but if so a dry razor is used.)

Originally, solutions containing 6 per cent. or even 8 per cent. of iodine were used, but it was soon found that this strength was too irritating to the skin. Solutions of 2 per cent. to 2½ per cent. were substituted: and these are found just as efficacious in maintaining asepsis, while irritation is reduced to a minimum.

Various solvents have been tried. Methylated spirit causes more irritation than rectified spirit. Iodine dissolved in acetone is said to be more bactericidal than either, but is far more irritant. With all these solutions pungent odours are evolved, causing great lachrymation to the nurse or dresser whose duty it is to apply them.

The application in most common use now is a saturated solution of iodine in ethylene dichloride ($C_2H_2Cl_2$). This contains 2.48 per cent. of iodine. Slight tingling of the skin is caused on application, but there is practically no subsequent irritation, and no pungent odours are evolved.

The methods employed by different surgeons vary slightly in detail, but the following will be found to fulfil all requirements.

About two hours previously (or less, in cases of emergency) the field of operation is painted with a solution of equal parts of ethylene dichloride and methylated spirit, by means of sterile swabs. This is followed by swabbing with pure ethylene dichloride. The saturated iodine solution is then painted on, and the whole area covered with sterile lint, and bandaged. When the patient is under the anæsthetic, and on the operating table, the iodine solution is painted on once more.

There are some slight disadvantages connected with

the iodine method. First, the vascularity of the tissues is increased, and the superficial hæmorrhage consequently greater. Secondly, the skin is hardened, and the edges of knives, &c., are dulled sooner than with the other process.

The advantages of the method, on the other hand, are of extreme importance. As far as is shewn by the figures at present available, the results obtained are every bit as satisfactory as with the older and lengthier process. There is obviously great saving of time: in cases requiring immediate operative interference, this is of immense value. The shaving and scrubbing, which the older method entails, are a source of great annoyance to the patient. They are lengthy and disagreeable at the time; they frequently cause considerable mental distress, leading to a disturbed night's rest, a very bad preparation for the shock of an operation on the morrow. Furthermore, the irritation caused by the growing of hair on the shaven parts is very tiresome during convalescence. All these troubles are avoided by the use of the method just described, and it appears likely that it will become more and more popular as its advantages are more widely recognized.

All instruments to be used during the performance of the operation must be boiled for fifteen minutes, and then placed in sterilized water, or some antiseptic fluid (*e.g.*, carbolic) until required by the surgeon. (*N.B.*—Perchloride of mercury should not be used, as metallic instruments are injured by it.)

There are two classes of persons required at the operation itself, *clean* and *unclean* (in a surgical sense). Both classes are essential, and their duties quite distinct. All that involves the touching of the area of operation, or of anything which is to come near this area, such as an instrument, or a sterilized towel, must be done by a *clean* person. Everything in which surgically *dirty* things are involved, such as lifting the patient on to the operating table, or holding a bowl of antiseptic, falls to the lot of the *unclean*.

It is obviously necessary to arrange for some connecting link between the clean and the unclean. For this purpose, a pair of forceps at least a foot long is used. The forceps are sterilized by boiling, and then

placed in a tall jar containing sufficient antiseptic (usually methylated spirit) to cover the beaks of the instrument, the beaks thus being kept sterile. An unclean person may hold this instrument by the handle, and with it pick up, say, an instrument from a dish of antiseptic, and place it upon the sterile towel with which the area of operation is surrounded (*vide infra*), without any contamination occurring. The forceps must then be returned to their tall jar until again required, care being taken that the beaks touch nothing dirty in transit.

If these principles are strictly adhered to, nothing comes near the field of operation, which has not been previously sterilized. We must now describe the methods by which a person taking part in the operation must render himself surgically clean. First he scrubs his hands and forearms for ten minutes with soap and water and a boiled nail brush. He then washes off the soap with sterilized water. Next he rubs his hands and forearms again for several minutes with gauze soaked in methylated spirit, and then rinses, in either 1 in 40 carbolic or 1 in 1,000 perchloride lotion. He then puts on a linen overall, previously sterilized. These overalls are made to fasten with tapes at the back, so that the fastening can be done by an unclean assistant. A sterilized linen cap is put on his head, so as to cover all the hair. A piece of gauze folded in four layers is passed over his mouth and nose, and either pinned or clipped at the back. He then puts on boiled rubber gloves, into the wrist portion of which the end of the sleeves of his overall are slipped. If the hand be previously moistened with methylated spirit, the gloves will be found to slip on quite easily.

The patient, having been anæsthetized, is lifted on to the table. The anæsthetist sometimes wears a gauze mask, but this precaution is not universally adopted. The bandages are removed by an unclean assistant, who next takes hold of the protective paper and the lint, his hand being *outside* the paper, and removes the two together, avoiding touching the prepared area. Sterile towels are now arranged all around the area of operation, only leaving exposed just sufficient surface for the surgeon's purpose. During the performance of the operation, these aseptic

principles are strictly followed. A basin is close at hand, in which the surgeon may rinse his hands. It may contain sterilized water or some antiseptic according to the taste of the operator. In either case, the fluid must be constantly changed.

These arrangements may appear at first rather fantastic and overdone, more so in print than in actual practice. But if normal healing of the wound is to be secured, it is essential that no precaution be neglected by which the entrance of bacteria can be prevented or even hindered. And practice has shewn that the only method of attaining this end is to be scrupulously, one might almost say absurdly, careful over every little point in the complicated ritual of asepsis; and to remember that the slightest carelessness in even the most insignificant detail may cause infection of the wound, and so at least delay healing, or even endanger the patient's life.

CHAPTER III.

INFLAMMATION.

Inflammation has been defined in various ways. Perhaps the simplest and best definition is that of Sidney Martin: "Inflammation may be considered as the reaction of the tissues to the irritant effect of an injury" Dr. Martin further divides injuries into four classes, mechanical, chemical, thermal, and bacterial.

There are five cardinal signs of inflammation in a part, *viz.*, redness, swelling, heat, pain, and impairment of function. None of the five are invariably present, and they vary according to the situation of the injury.

The phenomena which occur in inflammation can be studied microscopically in the web of a frog's foot, to which an irritant has been applied. Although, for the sake of clearness, the process is described as consisting of a series of distinct stages, it must be clearly understood that it is really continuous, all the stages running into one another.

The earliest changes are in the vessels. First, a *dilatation* of the vessels occurs, affecting the arterioles most, to a less extent the venules, and the capillaries least of all. This dilatation is the result of injury to the vessel itself: it is not carried by the nervous system, as is shewn by the fact that it occurs even if the nerves to the part have been cut.

At first, the vascular dilatation is accompanied by an acceleration of the rate of flow of the blood; but after a while this is replaced by a gradually increasing *retardation*, due to alteration in the vessel walls, and also in the capillary pressure.

The movements of the corpuscles in this stage may be compared to a crowd of people rushing along a street. At the end of the street we must imagine some obstruction to their progress, so that as they pass us

they are seen to go gradually slower; later on, when the obstruction in front does not break down, and the pressure from behind continues, they begin to oscillate backwards and forwards (period of *oscillation*) till at last they come to a standstill (period of *stasis*).

From the commencement of the process, the white corpuscles will have been seen to collect along the walls of the vessels; and the red corpuscles also tend to stick together, and to the vessel walls, forming rouleaux. This accumulation of leucocytes along the walls tends to increase the narrowing of the lumen of the vessels, while the adhering together of the corpuscles makes it increasingly difficult for them to pass along their normal course. Thus both these factors favour a condition of stasis. The process up to this point is known as the stage of *hyperæmia*.

The next stage is that of *exudation*. The fluid exuded may be of two kinds, *serous* or *plastic*.

In slight inflammations, and in early stages of more severe ones, there is merely an increase in the amount of normal fluid exuded into the tissues, and no change in the character of the fluid. This is called *serous* exudation, and the fluid is composed chiefly of blood serum, and is non-coagulable. In the later stages, however, there comes a change in the character of the fluid. Numerous leucocytes are found in it, and it is readily coagulable, owing to the presence of the fibrin-forming elements of the blood. This is *plastic exudation*. The fluid is often called "lymph."

Fairly early in the process of inflammation, the leucocytes begin to make their way through the vessel walls, and the more intense the inflammation, the greater the number of leucocytes that pass out. The leucocytes lying along the vessel walls in the stage of retardation of the blood seem at first to push out the wall into a sort of hump. This hump increases in size until it is held just by a stalk. The wall unites again on the inner side of the hump, and then the stalk gives way, leaving the leucocytes outside the vessel, though no break of continuity in the wall remains. This phenomenon is known as *diapedesis*.

In some cases of inflammation no diapedesis occurs. In order to explain this, it has been suggested that different irritants have different chemical effects upon

the leucocytes, some attracting and some repelling them. The name "positive chemiotaxis" is given to the former condition, while the latter is called "negative chemiotaxis."

The rapid exudation of a large quantity of fluid naturally exerts considerable pressure upon surrounding structures, especially in tissues which are not capable of stretching much. This may irritate the nerves of the part, bringing about pain, one of the five cardinal signs mentioned above. It may also interfere to a greater or less extent with the blood supply. In some cases the vessels may be so much compressed as to stop the flow of blood altogether. If this condition be not relieved it results in death of the part (gangrene, *q.v.*).

The special name of *catarrh* has been given to a form of inflammation which affects epithelial surfaces, and is accompanied by hyperæmia, and exudation of fluid, first serous, and later plastic. It occurs most commonly in mucous surfaces, such as the nasal mucous membrane. The pain in these conditions is described as smarting in character with a feeling of grittiness; this is very characteristic. (*Eczema* is a catarrhal inflammation of the skin.)

Inflammation may terminate in a variety of ways.

(1) When the injury is so slight that the vitality of the tissues of the part is not destroyed, *resolution* may occur. This consists of a simple reversal of the process described, the affected part being restored to its original condition. The stationary corpuscles first begin to oscillate backwards and forwards; then the blood-stream gradually moves forwards once more, gradually increasing in rate until the normal speed is attained, just as the *queue* waiting at the pit door of a theatre behaves when the doors are open. The exuded fluid is removed by the lymphatics. The leucocytes which have escaped by diapedesis return to the circulation either *viâ* the lymphatics, or else by a similar method to that by which they left it. Some of them may be actually absorbed in the tissues. Resolution is very rarely seen in inflammation of bacterial origin, but more commonly when mechanical injury is the exciting cause.

(2) When the vitality of the tissues has been to some

extent destroyed, the dead tissue may disappear, and fibrous scar tissue take its place. This is known as *repair*. The fibrous tissue is formed by the connective tissue cells.

(3) If the irritant be still more intense, *suppuration* may occur. The exudate and the dead tissues become liquefied, and *pus* is formed. Pus consists of the liquefied tissues of the part, and the fluid exudate, in which float numerous dead and living leucocytes.

(4) In still more intense inflammations, the vitality of large areas of tissue may be destroyed, and *gangrene* is said to have occurred.

(5) When the suppuration or the gangrene affects an epithelial surface, it is known as *ulceration* (*q.v.*). If the irritant continues to act for a prolonged period, the result is a *chronic* inflammation. Considerable fibrous thickening of the part usually occurs; the exudation of lymph may be organized into fibrous bands (adhesions), or the fluid exudation may persist as a *chronic effusion*.

The main difference between an acute and chronic inflammation is that, in the latter, the reaction of the tissues is much greater, a large amount of fibrous tissue being formed. Suppuration occurs less frequently in chronic inflammation.

The **clinical signs** of inflammation are *local* and *general*. The local signs have been already mentioned, *viz.*: Redness, swelling, heat, pain, and impairment of function. The heat and redness are due to the hyperæmia; the swelling partly to the hyperæmia, but chiefly to the exudation of fluid; while irritation of the peripheral nerves is responsible for the pain. The impairment of function may be secondary either to the swelling or pain, or both, or to the effect of the bacterial toxins on the cell protoplasm.

The general signs vary according to the part involved, and the cause of the inflammation.

If an important organ is involved, symptoms dependent upon the impairment of function of that organ may be present. Slight temporary pyrexia (fever) may occur in simple non-bacterial inflammations.

Bacterial inflammations, especially when suppuration has occurred, are almost always accompanied by fever.

The temperature is elevated, the pulse and respirations rapid in proportion. If the condition goes on, the tongue becomes dry and furred, the lips and teeth are covered with collections of dried mucus (sordes), the skin is dry and hot, the patient passes a small amount of highly coloured urine which frequently contains large deposits of urates, and often a trace of albumen; constipation is the rule, but diarrhœa may occur.

In the case of specific infections, symptoms dependent on the action of the specific bacterial toxin may supervene. When suppuration occurs, as has been described, a certain amount of normal tissue is destroyed, and the *débris* collects as *pus*. When this collection of pus is contained in a definite walled-in cavity, it is known as an *abscess*. When the signs of inflammation are well marked, and the abscess forms rapidly, it is an *acute abscess*: this is most commonly due to pyogenic cocci. A *chronic abscess* is one which forms slowly, without signs of intense inflammation. Owing to the prolonged irritation, there is usually considerable fibrous thickening of the walls of the abscess cavity. It is less commonly due to pyogenic cocci than the acute variety. Dead streptococci or staphylococci may sometimes be responsible for a chronic abscess. The tubercle bacillus is a common cause. When the pus is diffused throughout the tissues, without any definite abscess cavity, the condition is termed *diffuse suppuration* or *cellulitis*. In all cases of suppuration, the tissues involved tend gradually to die, and are cast off in the pus. In the more intense inflammations, these portions of necrotic (dead) tissue may be of sufficient size to be easily visible, and to be seized with forceps; they are then known as *sloughs*. When a whole large area of tissue dies, it is said to be *gangrenous* (*q.v.*).

A *cold abscess* is one in which the formation of pus is so rapid that from this point of view the abscess would be called acute; on the other hand, the signs of acute inflammation, *viz.*, redness, heat, swelling, pain are little in evidence. There is seldom much thickening of the walls, and the pus is usually thin and watery. These abscesses are mostly tuberculous in origin.

When an abscess heals, it does so by the formation

of new tissue (granulation tissue) similarly to the method of healing of an ulcer (*q.v.*), the granulations gradually forming from the bottom.

It sometimes happens that something remains behind in the abscess cavity after it has been opened, such as a foreign body, a piece of dead bone, a little pus which is unable to escape, &c., which keeps up the irritation. The abscess may then not completely close; a thin track remains leading down to the bottom of the abscess, its opening generally containing abundant sprouting granulation tissue, and discharging pus. This is called a *sinus*. On the removal of the source of irritation, healing usually occurs rapidly. It is important to recognize the difference between a sinus, as described above, and a *fistula*. A fistula is an abnormal communication between two cavities normally present in the body (*e.g.*, a recto-vesical fistula between the rectum and the urinary bladder) or between one such cavity and the surface of the body. A sinus is an abnormal communication between the surface of the body and an abnormal cavity such as an abscess cavity.

It may be useful at this point to review the subject briefly by means of a simile. In a bacterial inflammatory process, the active elements concerned may be very roughly divided into three classes: first, the leucocytes, whom we may liken to policemen; the bacteria, who are foreign and undesirable aliens; and the red corpuscles, the ordinary "men in the street," useful and desirable in their proper place, and when fulfilling their proper function, but extremely tiresome when, for one reason or another, they do not do their duty.

The whole trouble is begun by the undesirable alien, and to effect a cure, this class must be as far as possible annihilated. By the action of these bacteria, the red corpuscles are induced to leave off work, and collect in crowds around the injured spot, "on strike" as it were, and hindering the police in the execution of their duty. It is neither necessary nor desirable to destroy this class. If the crowd of loafers be "moved on" to other healthy parts of the body, where the local police are able to deal with them, that is all that is needed.

If in an encounter between police and invaders, there are many casualties on either side, the dead bodies remain about the battlefield in the shape of pus. This naturally hinders the remaining leucocytes from dealing effectually with the invading bacteria, and must be got rid of at once.

The *treatment* of inflammation is founded practically on these principles:—

(1) If possible, remove the exciting cause. If it be bacterial, by free incision, scraping away dead or diseased tissues, and the application of antiseptics. If suppuration has occurred, it is essential that free exit should be given to the pus. Any foreign body should be removed.

(2) Prevent any further invasion by careful antiseptic dressing.

(3) Get rid of the crowds of red corpuscles which are in the way, or, to put the same idea in surgical language, *reduce the hyperæmia*. This may be done in a variety of ways. Blood may actually be removed from the circulation by means of leeches, cupping, or actual incisions. *Counter-irritation* also aims at the same thing, by withdrawing blood from the diseased area to the healthy parts around. If the inflammation is in a limb, the elevation of the part will assist in reducing the hyperæmia, as also will the application of cold by means of an icebag, or iced water run through Leiter's tubes (coils of narrow metal tubes made to encircle the part, through which a stream of iced water is forced). The application of cold is only advisable quite in the early stages, as it tends to depress the general vitality of the part.

In chronic cases, Scott's dressing (Ung. Hydrarg. Co.) and massage are used.

(4) The application of *moist heat* is a very common method of treatment. It acts by causing dilatation of the vessels, and so relieving the pain by lessening the tension. It increases the general vitality of the part, and hastens the return of the normal circulation.

(5) *Rest* is an extremely important part of the treatment. There is quite enough to be done in clearing out the invaders, and repairing the damage done, without any additional work in the way of active movement of the part.

(6) The patient's general strength must be kept up by the administration of tonics, &c.; and the elimination of toxic substances from the system induced by purgation and diuresis.

(7) In inflammations due to specific causes, drugs which have a specific action in the malady should be administered, *e.g.*, salicylates in rheumatism.

(8) In those bacterial infections in which an *antitoxin* has been prepared, such as tetanus or diphtheria, a suitable dose should be given.

(9) A *vaccine* may be prepared, and administered (p. 10).

CHAPTER IV.

ULCERATION.

Ulceration, or progressive molecular death, as it has been termed, is the death of small portions of tissue. It is due to irritation followed by inflammation and destruction of tissue. Any general condition which tends to depress tissue vitality will act as a predisposing cause of ulceration.

Ulcers may be divided into two main groups:—Simple and Malignant. The latter are dealt with in Chapter XIV. Simple ulcers may be further divided into those due to the action of a specific micro-organism (syphilis, tubercle, &c.), and those due either to the non-specific pyogenic micro-organisms or to injury. The former are considered together with the diseases of which they are a manifestation. The latter must be dealt with in a little detail here.

For the sake of clearness, three stages of simple ulceration are described:—*Extension*, *Transition*, and *Healing*. It will be well to reiterate here what was pointed out when discussing the various stages of inflammation, that *all the stages run imperceptibly into one another*. It is not possible to draw a sharp line between one stage and another: to say, "Before that point, the ulcer is in the stage of extension, and after that point, in the stage of transition."

Stage 1.—Extension.—The typical ulcer in this stage has a dirty grey surface with thickened margins; the surrounding tissues are usually red and inflamed. The base of the ulcer is thickened and hard, and often fixed to the tissues beneath it. There is generally a considerable quantity of thin, watery discharge, often containing escaped blood, but not much pus.

Stage 2.—Transition.—The surface gradually loses its dirty grey colour, and is covered with a film of exudation. This, later on, becomes dotted over with little pink granulations which increase in number until they cover the whole surface. There is less thickening

of the margins and base; the discharge is less in amount.

Stage 3.—Healing.—The ulcer now has a smooth red surface, covered with granulations. There is no marked thickening of the margins or base; the discharge is almost absent, unless sepsis occurs, when it will become purulent.

The margin of a healing ulcer is described as consisting of three zones of colour, the colour being modified by the amount of epithelium present. The outermost zone is composed of practically healed tissue, and is whitish in colour; the innermost zone consists of granulation tissue, and is therefore red; while, in between, the granulation tissue is covered by more or less epithelium, forming a bluish zone.

Many varieties of injury may be responsible for ulceration. As examples we may mention irritation from the rubbing of a rough boot, pressure and irritation of badly padded splints, burns, scalds, bedsores.

There are certain special forms of chronic ulcer that demand special mention.

Varicose ulcers occur on the legs of patients suffering from varicose veins. They are usually situated in the lower and inner part of the leg, on account of the venous distribution.

The surface is usually of a greyish colour, often discharging thin watery pus. The edges are clean cut, but as a rule irregular; they are often thick and overhanging. The base is attached to underlying parts, often to the bone. Ulcers of this type are described in patients who do not suffer from varicose veins. They are then called *callous ulcers*, but do not differ in any other respect from the varicose variety. Both these forms of ulcer may be the seat of carcinomatous changes (*vide* p. 112).

In certain cases, peripheral nerve filaments appear on the surface of the ulcer, forming spots exquisitely tender to touch. The name *irritable ulcer* is given to these.

An eczematous condition of the surrounding skin, due to the irritation caused by the discharge, is a frequent complication of these ulcers.

The *treatment* of an acute ulcer is quite simply divisible into three heads :—

(1) Remove the cause.

(2) Render the part aseptic and keep it so. The method most commonly adopted is to apply boracic fomentations. During the healing stage, greasy preparations, such as boracic acid ointment, are substituted for the fomentations. Prominent granulations should be checked by the application of solid silver nitrate. Lotio rubra, a solution of zinc sulphate, coloured with compound tincture of lavender, is of great value in the healing stage.

(3) Keep the part at rest.

When the surface of the ulcer is very large, skin grafting may be required.

The treatment of **chronic ulcers** is often very tedious and unsatisfactory. The chief reason for this is, that these ulcers most commonly occur in women of the lower classes, who cannot rest and will not keep clean. And as rest and cleanliness practically sums up the treatment, failure is hardly a surprise.

Where the varicose condition of the veins is very extreme, operative treatment, which consists in removal of the dilated veins above the ulcer, should be practised. This again is difficult, as the class of patient with whom one has to deal can rarely spare the time for the operation, and would much prefer to have "some medicine for it."

When there is much discharge, the ulcer should be frequently dressed (*e.g.*, every three or four hours) with boracic fomentations, and firmly bandaged.

When the discharge has lessened, *Unna's method* may be employed. Unna's paste consists of gelatin 20 per cent., zinc oxide 20 per cent., boric acid 4 per cent., glycerine 32 per cent., water 24 per cent. This is melted by placing the vessel containing it in boiling water. The whole limb from toe to just below the knee is well washed with soap and water, and then with 1 in 1000 perchloride lotion. It is then lightly sprinkled with boracic powder, as a preventive of itching, and of eczema. The limb is then bandaged from the roots of the toes to just below the knee (excluding the heel unless the ulcer involves it, which it rarely does) with a sterile bandage. This should be done firmly, and as far as possible without reverses. The melted Unna's paste is then painted on all over

the bandage. A layer of gauze or wood-wool is applied over the paste, and another bandage over all. This dressing soon sets hard, and forms a very efficient support.

Eczema around the ulcer is best treated by calamine lotion or ichthyol ointment.

The best method of dealing with the painful spots in an "irritable ulcer" is to anæsthetize the patient and thoroughly scrape the surface of the ulcer.

It may be by no means easy to say with certainty that a given ulcer on the leg is not syphilitic in nature. In any case in which there is the slightest suspicion, potassium iodide gr. xv should be prescribed three times a day for a week, in addition to the other treatment. If this has a markedly favourable effect on the ulcer, the drug should be continued.

When large doses of iodides are prescribed, the possibility of *iodism* must not be forgotten. Iodism is the name given to a series of symptoms due to the toxic effect of the drug. The symptoms resemble those of a common cold, *viz.*, running at the nose, sore throat, dull headache, especially over the frontal sinus.

Different patients vary very much in the rapidity with which they react to iodides.

If the drug be discontinued until the toxic symptoms have disappeared, and then re-administered in smaller doses, the iodism often does not recommence. It is also frequently the case that the administration of twice the quantity of iodide will put an end to the iodism.

There is another type of ulcer which falls under this heading, namely, the *trophic ulcer*, as it is probable that the actual exciting cause is some slight injury. The trophic ulcer, however, differs from those already described, in that it is dependent on an important underlying cause, namely, some interference with the nerve supply of the part. If the passage of impulses along the nerve supplying a given area be interrupted in any way, that area is very prone to undergo ulceration. There is one particular type of ulcer known as the *perforating ulcer* of the foot, which occurs in certain diseases of the central nervous system, notably tabes dorsalis (locomotor ataxy) and syringomyelia.

There are two important factors involved. First, there is a diminished sense of pain in the part, or sometimes complete anæsthesia; and, secondly, there is interference with the trophic function of the nerves. Both these conditions depend upon the underlying disease. Owing to the diminution or absence of the sense of pain, the gravity of an injury is not appreciated by the patient, and the early stages may thus escape notice, and progress untreated. The interference with the trophic function lowers the vitality of the tissues, rendering them less able to combat the ulceration.

Perforating ulcers commonly occur under the head of the first metatarsal bone, a point which is subjected to considerable pressure in walking. As the name implies, these ulcers penetrate very deeply, the external opening being usually quite small. The epithelium tends to grow down the sides of the ulcer, and thus delay healing. Perforating ulcers are usually quite painless. They may occur in other situations, but the foot is most commonly affected.

The *treatment*, of course, must be directed chiefly towards the general underlying disease, for an account of which a text-book on medicine should be consulted.

The local condition should be treated by absolute rest, and the avoidance, as far as possible, of all pressure. The down growth of epithelium, mentioned above, should be excised, or scraped away and cauterized, and any unhealthy parts of the surface should also be well scraped. Non-irritating dressings, such as boracic ointment, should be applied.

Prophylactic (preventive) treatment is of paramount importance in all conditions in which trophic ulcers are likely to occur. All undue pressure must be avoided, and great care taken to guard against injury. Burns from hot-water bottles in parts of the body devoid of sensation are a common cause of ulceration; great care, therefore, should be exercised in this direction.

CHAPTER V.

GANGRENE.

By gangrene is meant the death of a considerable tract of tissue *en bloc*. It may be divided into two classes, according to its cause:—

(1) Gangrene dependent upon interference with the blood supply of the part.

(2) Gangrene due to the agency of micro-organisms, or *Septic Gangrene*.

Gangrene of vascular origin may be either *dry* or *moist*. This depends chiefly upon the condition of the part immediately previous to the onset of the gangrene. If the condition is due to a gradual narrowing of the lumen of the arteries, the veins being unaffected, there will be little moisture remaining in the part and the gangrene will be *dry*. If, on the other hand, the flow in both arteries and veins is suddenly blocked, the part will be full of blood, and *moist* gangrene will result.

Septic gangrene is always of the moist variety. If micro-organisms gain access to a part affected with dry gangrene in its earlier stages, the sepsis will convert it into moist gangrene.

Dry Gangrene.—The chief varieties of dry gangrene are:—

(1) *Traumatic* either from direct injury to the main artery, or from pressure, say, of a piece of fractured bone upon the vessel. It may also result from severe burns; from the action of corrosive substances, such as strong acids (*e.g.*, sulphuric or carbolic acids); or from extensive crushing injuries by which the vitality of the part is destroyed. The application of carbolic acid, even in weak solutions (*e.g.*, an ordinary compress of 1 in 40), for any length of time is very liable to be followed by dry gangrene, especially in patients whose general strength is depressed.

Frost-bite may cause gangrene; it is dependent upon the shrivelling up of the vessels in the extreme cold, and may, therefore, be classed as traumatic. If the

cold lasts a sufficient time the arteries themselves become gangrenous; when this has occurred the subsequent warming of the part will not relieve the condition.

(2) *Embolic* from the lodgment of an embolus in a main artery.

(3) *Thrombotic* from general arterial thrombosis.

(4) *Senile*, due to gradual narrowing of the lumen of the arteries from chronic arterial disease, ending in complete occlusion. It is most common in the lower limbs.

(5) *Idiopathic (Raynaud's disease)*, generally supposed to be due to spasm of the arterioles of the part, probably a vasomotor phenomenon. It affects most commonly the fingers and toes of children or young adults.

(6) Gangrene due to poisoning by *Ergot* is rare in this country. Ergot is a fungus which infests rye. The disease, *Ergotism*, is therefore commoner in those countries where rye bread is a usual article of diet. One of the effects of ergot is powerful contraction of the peripheral vessels, and it is to this effect that the gangrene is due.

(7) *Diabetic* gangrene depends upon two factors, partly the lowering of tissue vitality by the abnormal condition of the blood, and partly the endarteritis which is so often associated with diabetes.

Symptoms and Signs.—There are certain clinical phenomena which are common to all forms of gangrene, viz.:—

(1) *Cessation of the arterial pulse.*

(2) *Fall of temperature* in the affected part.

(3) *Anæsthesia* of the part. This anæsthesia is apparently not complete, because referred pain from the boundary of healthy and diseased tissue often gives rise to an impression of pain in the diseased part, though the patient is unable to appreciate irritation in the affected area.

(4) *Loss of function* in the part.

(5) *Change of colour*, which varies according to the type of gangrene present.

The *clinical history* of simple dry gangrene varies according to the rapidity of onset.

When the onset is acute, as in gangrene due to embolus, injury, and sometimes in Raynaud's disease,

there is usually severe neuralgic pain at the commencement of the disease. The part becomes cold, white, and pulseless. The colour changes to bluish, and later to dark brown or black. The skin wrinkles, and becomes hard and dry. This is most marked at the periphery.

Where it joins the healthy tissue the gangrenous part is rather redder and slightly œdematous. At the margin of this red area a bright red line appears. This is the *line of demarcation*, and marks the point at which Nature, if left to herself, will separate the dead from the living tissue. This separation is brought about by a simple process of ulceration, which progresses until the gangrenous part is completely cast off. The ulcerated surface then behaves like a simple healing ulcer. The part cast off will often be found to be completely mummified.

The process described only occurs in dry gangrene which has been kept aseptic.

If the gangrene be moist, the part does not become mummified. The tissues rapidly decompose; the skin becomes bluish and peels off; offensive gases are formed, and the part becomes œdematous. A *line of demarcation* is formed as described above, but it is very rare that separation of the part is brought about, as toxic substances formed by the decomposing tissues are absorbed into the system, and general sepsis almost invariably occurs. Constitutional symptoms, such as fever, asthenia, &c., are more marked in this type, and fatal termination unfortunately common.

Treatment.—In the case of dry gangrene strenuous efforts must be made to maintain asepsis. The part must be carefully purified; if it involves a limb, the nails should be cut and carefully cleansed. The part must then be covered with a *dry* aseptic dressing. All moisture must be avoided as far as possible. If no sepsis occurs, the line of demarcation will form as described above. Amputation should then be performed, sufficiently far above the line of demarcation to ensure that the amputation flaps are properly supplied with blood. Attention must also be paid to the usefulness of the stump. It may be necessary to sacrifice some healthy tissue in order to obtain a serviceable limb.

In old patients with extensive arterial disease the question of amputation is a very difficult one to decide, and each individual case must be considered on its own merits. Space forbids us to discuss this question fully. Suffice it to say that in these cases the vitality of the limb may be so depressed, and the circulation so much impeded by arterial disease, that if amputation be performed, even far above the line of demarcation, the injury of the operation may be sufficient to determine the onset of gangrene in the flaps. In these cases the only treatment is to keep the part aseptic and to husband the strength of the patient.

In moist gangrene, and when sepsis has occurred, immediate amputation must be performed, well above the seat of the disease.

The following varieties of *Septic gangrene* in which micro-organisms form the primary cause of the condition are usually described:—

(1) **Acute Spreading Traumatic Gangrene.**—This condition is extremely grave, and commonly terminates fatally. It may occur as a sequela of any severe injury, especially compound fracture. It differs from the types of gangrene above described in its tendency to spread in all directions. It is not wholly governed by the position of the injury, but may spread up the limb, above the lesion.

It commences at the edges of the wound, not at the periphery of the limb. The skin becomes purple, gradually darkening to black. The disease spreads very rapidly, and there is much œdema; decomposition soon occurs. Marked *Surgical Emphysema* (air in the tissues) is present, due in most cases to the activity of *Bacillus œdematis maligni*. As the disease spreads rapidly in all directions, it will be clear that no line of demarcation will form. Constitutional symptoms are remarkable in that there is, as a rule, profound asthenia, associated with normal, or even subnormal, temperature.

The only hope of saving the life of the patient is immediate amputation well above the site of disease; but recurrence of gangrene in the stump is unfortunately common.

(2) **Hospital Gangrene.**—This term is applied to rapidly spreading gangrene affecting operation wounds.

It is practically unknown since the introduction of antiseptic methods.

(3) **Phagedæna** is a type of gangrenous ulceration which sometimes affects venereal sores. The term has also been used as identical with hospital gangrene.

(4) **Cancrum oris** is a form of gangrenous ulceration occurring in early childhood. It is more common in town than country, and is almost entirely confined to the children of the poor. It is often a sequela of one of the acute specific fevers, especially measles. It will be seen, therefore, that conditions which tend to lower tissue vitality act as predisposing causes.

The actual exciting cause of the disease is micro-organic. No specific organism has been isolated, and it is probable that the various organisms normally present in the mouth, including *Streptococcus pyogenes*, are jointly responsible. They gain access first through some slight abrasion of the buccal mucous membrane, either on the lips, gums, or cheeks, or occasionally through the socket of a tooth. From this point of entrance the disease spreads rapidly and is very destructive. Large portions of cheek or gum may be destroyed; necrosis of the jaw may occur.

The discharge is extremely foul and toxic, and is generally swallowed continuously, frequently giving rise to septic broncho-pneumonia or even septicæmia (*q.v.*), either of which complications may rapidly prove fatal. A fatal result may occur without these complications, from exhaustion and the toxic effects of the disease. Pyæmia (*q.v.*) may occur from implication of a large vein, often the facial vein.

In the early stages the temperature is usually considerably raised (103° or 104°), and rigors are often present. At the end the temperature usually falls below normal, and coma supervenes.

Treatment consists in the removal of all traces of diseased tissue under an anæsthetic.

Noma Vulvæ is a similar condition affecting the vulva and surrounding parts in a similar type of patient.

A **boil** or **furuncle** is a staphylococcic inflammation of the skin and subcutaneous tissue, which commences in a hair follicle.

At first a painful reddish nodule is formed in the

skin. The central part becomes gangrenous. A pustule then forms, which bursts, the central gangrenous portion being separated and discharged as a slough. Boils are generally multiple, the whole condition being known as *Furunculosis*. Constitutional disturbances predispose to the condition.

Furunculosis is more common in men than women, the patients usually being young adults. The most frequent situations for the disease are the back of the neck and shoulders, and the buttocks.

Treatment consists in incising the boils, with antiseptic precautions, when the pustular stage is reached, applying pure carbolic acid, and dressing aseptically. Any general condition which may be present must also be treated.

The administration of calcium carbide $\frac{1}{4}$ gr., in pill form, three times a day is often of value.

A **carbuncle** is also a staphylococcic infection. It involves the subcutaneous tissue primarily, reaching the skin later. (The reverse is the case with a boil.) Carbuncles are usually single, and are much larger in size than boils. They occur in similar situations in a similar class of patient.

Local treatment consists in making a free incision, and scraping away all diseased tissue under an anæsthetic, and applying pure carbolic acid. Antiseptic dressings are then required.

General treatment may be required, if the general conditions demand it. For example, diabetes is a common predisposing cause both of carbuncles and boils, and if present will, of course, require to be dealt with. In this connection it should be noted that a transient glycosuria (sugar in the urine) may occur when carbuncles are present, disappearing as soon as they have been dealt with. This must not be mistaken for diabetes mellitus.

Vaccines have been used, often with great benefit, in the treatment both of carbuncles and of boils.

CHAPTER VI.

WOUNDS.

A **wound** is an injury which involves solution of continuity of the skin or mucous membrane.

An injury to subcutaneous tissue, the skin or mucous membrane remaining intact, is called a *contusion*.

Both conditions result from the application of external violence, the kind of injury depending upon the amount of force exercised and the nature of the instrument employed.

A **contusion** is caused by a blunt instrument, when the skin is not broken.

The clinical signs of a contusion are: pain, subcutaneous hæmorrhage, and swelling. In slight cases the hæmorrhages are minute and discrete, scattered through the subcutaneous tissues.

In more severe cases extravasation of blood occurs under the skin, resulting in discoloration. At first, the colour of the skin is bluish-black, gradually it passes through brown to yellow, and so disappears. The intensity of the discoloration varies in different situations. Where the tissues are lax there is little to interfere with the dispersion of the blood, and therefore much discoloration occurs. In situations where dense fasciæ are present and the hæmorrhage has occurred below them, there may be little or no discoloration, or it may take longer than usual to develop. This subcutaneous hæmorrhage is known as a *bruise* or *ecchymosis*. The swelling also varies considerably in amount and is governed by similar factors.

If the hæmorrhage takes place into a space in which it is confined by definite boundaries, such as, for instance, the tunica vaginalis, or beneath the aponeurosis of the occipito-frontalis muscle, it collects there, forming a fluctuating swelling known as a *hæmatoma*. This may closely resemble an abscess, but the history of injury and absence of signs of inflammation usually suffice to determine the nature of the condition. Later,

a deposit of fibrin occurs in the blood in hæmatoma. The fluid is usually completely absorbed. The fibrin may also be absorbed entirely. In other cases it may persist as a fibrous tumour. In rare cases, after the partial absorption of both solid and fluid contents of the hæmatoma, a definite capsule containing serous fluid persists.

The *treatment* of contusions consists in the application of evaporating lotions, *e.g.*, *lotio plumbi*. Tincture of arnica is also often used. In very early stages, before the discoloration has made its appearance, relief of pain may be obtained by fomentation. Where a hæmatoma exists in very tense tissues, the pain caused may be very great. In these cases it may be permissible to puncture it, squeeze out the contents, and apply pressure to prevent further hæmorrhage, great care being taken to maintain asepsis. The act of puncture converts the contusion into a wound and thus introduces the necessity for aseptic treatment.

In very severe cases consitutional symptoms may be present. They must be dealt with on the general lines indicated on p. 53.

There are three chief varieties of wounds:—

(1) *Incised*; (2) *Punctured*; (3) *Lacerated*.

(1) An **incised wound** is one made with a sharp, cutting instrument. The most typical example is an operation wound. It is cleanly cut, and there is little or no bruising of surrounding parts. The hæmorrhage is usually profuse, depending, of course, upon the position of the lesion and the size of the vessels injured.

Treatment.—If an important organ, such as stomach or bowel, &c., is included in the wound, special operative interference may be necessary, into the details of which space does not permit us to enter. If no important organ is wounded, the first essential is to arrest the hæmorrhage. In slight cases this end may be attained by exposing the part to any extreme of temperature, either heat or cold. Either ice-cold water or water as hot as the patient can bear should be employed. Warm water should not be used, as it does not tend to arrest the hæmorrhage. If this method fails our next sheet-anchor is *pressure* in some form or other. Slight cases can usually be arrested by the application of a firmly-bandaged dressing.

There are certain drugs which, when applied locally, tend to arrest hæmorrhage. These drugs are known as *Styptics*. They are only of value in cases of slight hæmorrhage, and even in slight cases are of less efficacy than pressure if the wound is in such a position that firm pressure can be applied. Their scope is consequently limited, but in some situations they are of considerable value. This is the case when dealing with hæmorrhage after the extraction of a tooth. It is true that pressure can be applied to a tooth-socket by means of a firm plug of cotton-wool, retained in place if necessary by a cork, or an anæsthetist's gag. It is difficult to apply very firm pressure with plugs of cotton-wool alone, and the plugs frequently become dislodged. Pressure by means of a cork may be painful. Styptic drugs, therefore, are of value in these cases.

Styptics may roughly be divided into two classes, according to their mode of action:—

(1) Drugs which cause a *local constriction of the blood-vessels*.

There is only one drug in constant use which acts in this way, namely, *Adrenalin*. This substance is one of the most valuable styptics we have. It is a very powerful drug, and is used in very weak solution, *viz.*, 1 in 1000. It should be noted that adrenalin solutions rapidly deteriorate under the influence of light and air, and therefore should be freshly prepared, if possible, and kept in the dark in brown glass bottles. The drug should be applied to the bleeding area on lint or cotton-wool and bandaged. When the hæmorrhage follows the extraction of a tooth, the socket should be plugged with pledgets of wool soaked in the adrenalin solution. It should be noted that pressure acts in the same way as adrenalin, namely, by inducing a local constriction of the blood-vessels.

(2) Drugs which induce *coagulation of the protein in the blood*.

There are a large number of drugs included under this heading which have earned great reputations, sometimes deserved and sometimes undeserved. *Tannic Acid* is, perhaps, the best known. It may be applied in powder upon cotton-wool. Several other drugs are used which derive their styptic value solely

from the fact that they contain a percentage of tannic acid, *e.g.*, Hamamelis, Krameria, &c. It stands to reason that pure tannic acid will act more rapidly and efficiently than some drug containing only a percentage of the acid, and therefore these other substances may be discarded in favour of the pure acid.

Solid *silver nitrate* is another useful styptic, as also is *powdered alum.*

Certain compounds of *Iron* have a great reputation as styptics, notably, ferric chloride. The liquor ferri perchloride is the preparation usually employed. The use of iron salts for this purpose cannot be too strongly condemned. Though large doses of iron may be given by the mouth without any untoward results, iron, when it reaches the blood-stream, acts as a virulent poison. (When given by the mouth only minute quantities of the drug are absorbed.) It will be clear that if iron is applied to an open wound with a view of arresting hæmorrhage, there is considerable danger of a portion of the drug being absorbed into the circulation. Death has occurred on more than one occasion from the application of perchloride of iron to the uterus in order to stop post-partum hæmorrhage. Its value as a styptic is by no means sufficient to warrant incurring such a grave risk.

The use of *fibrin ferment* in hæmophilia is discussed on p. 105.

Another drug which must be mentioned in this connection is *calcium.* Opinions as regards its efficacy are divided. As is almost always the case when differences of opinion exist among the medical faculty, there are people on both sides who go very much too far. In their attempts to pour contempt upon their opponents they make, in the heat of the moment, exaggerated statements which they do not really believe, but these statements once made must be fought for through thick and thin, and often through the medium of a text-book by their author they pass into current teaching.

It is always better in text-books to steer a middle course. And it can safely be said that there are cases of hæmorrhage in which calcium is of value, and there are also cases in which it is of no value. In dealing with the disease, hæmophilia, in Chapter XIII, the

student's attention will be called to the fact that the blood in the hæmophilic patient contains plenty of calcium, and that its failure to coagulate is due to a scarcity of fibrin ferment. This is an experimental fact, and must be accepted as such. It is also said that hæmophilia is a disease which occurs almost invariably in males; some authorities deny that females are ever affected. This may or may not be true. But the fact remains that there does exist a condition which attacks females certainly as often if not more often than males in which most dangerous hæmorrhage occurs from the most trivial wounds. Many such cases have occurred in the author's personal experience, in which the patients (always females) have been at the point of death from hæmorrhage following the extraction of a tooth. And in these cases the administration of 10 gr. of calcium lactate three times a day for five days before operation has been completely successful, the operation being conducted without any severe subsequent hæmorrhage. In one particular case under the author's care, the patient some years after consulted another dental surgeon, who, being unaware of her previous history, omitted the calcium treatment. The result was that the patient again very nearly died of hæmorrhage after the operation. Possibly these cases are not examples of hæmophilia, but they are none the less serious, and must always be borne in mind.

Another type in which there is great tendency to uncontrollable hæmorrhage is the deeply jaundiced patient. In these cases, also, calcium is of great value.

Calcium has also been used as a local styptic, but does not appear to be of great value.

In more severe cases, where a larger artery is wounded, it will be necessary temporarily to stop the bleeding by compressing the main artery on the proximal side of the injury, either with the fingers or by the application of a tourniquet. The hæmorrhage being thus temporarily controlled, the cut ends of the injured vessel should be sought, seized with Spencer Wells's forceps, and ligatured.

Small arteries, if completely divided, usually retract and stop bleeding without interference, but if only partially divided they cannot retract, and consequently

continue to bleed. The treatment of such a case clearly is to *divide the injured vessel completely*.

The second essential in the treatment is to cleanse the wound. The amount of cleansing required will depend to some extent upon the nature and cleanliness of the instrument by which the injury was inflicted. But in any case the wound should be thoroughly washed with some antiseptic lotion (*e.g.*, carbolic 1 in 40), all visible particles of dirt being removed.

The third point should, perhaps, have been put second, namely, constitutional treatment. This only requires attention in severe cases, but then it is of paramount importance. If much blood has been lost the patient may be collapsed, and at the point of death from actual exhaustion. As soon as the hæmorrhage has been arrested, at least temporarily, attention must be paid to constitutional treatment. It is not desirable in the early stages to give stimulants, such as strychnine, to any great extent. The natural means of arresting hæmorrhage is by the formation of a clot. If stimulants be given there is a danger that the clot may be disturbed by the increased blood-pressure, and the hæmorrhage break out afresh. In these cases of collapse, due to profuse hæmorrhage, the best drug to give is opium in doses of half a grain frequently repeated, say, every hour for five hours. In very severe cases a saline infusion may be necessary. The method of administration of a saline infusion is as follows:—

One to two pints of normal saline solution is infused under the skin, by means of a hollow needle connected to a glass vessel by rubber tubing. This whole apparatus must be boiled before use, as also is the saline solution. The groins are usually chosen as the site of infusion. The rate of flow can be regulated by raising or lowering the glass vessel. The feet should be slightly raised above the level of the head and hot bottles applied to them.

Having arrested the hæmorrhage, rendered the wound aseptic, and treated the collapse, if present, the surgeon must turn his attention to bringing the edges of the wound together. If the wound is quite small, this may be effected simply by the pressure of a dressing. Otherwise, it will be necessary to insert one or

more stitches, as may be required. Sufficient stitches must be used to avoid undue tension on any one of them. To ensure rapid healing, and render the subsequent scar as small as possible, it is very important that the edges of the wound should be in quite close apposition. If sepsis is present, or if it is doubtful whether the hæmorrhage has been completely arrested, the insertion of a rubber drainage tube may be required. It should be quite small (*e.g.*, the size of a No. 8 catheter), so that the edges of the wound are not separated more than is necessary. It can usually be removed after twenty-four hours. After the insertion of the tube an aseptic dressing is applied. Complete rest of the injured part should be enjoined.

(2) A **punctured wound** is one made with a sharp, pointed instrument; it is of such a shape that the depth from the surface to the bottom of the wound is its longest dimension. It may be caused by a variety of instruments, from a tin-tack or a hat-pin, to a dagger or a bayonet.

The general principles governing the treatment of punctured wounds are exactly similar to those already described under incised wounds (*q.v.*). An accident more liable to occur in a punctured than an incised wound is that the point of the instrument may break off in the wound. The fragment must be at once removed; X-rays may be required in order to locate it.

(3) A **lacerated** or **contused wound** is made by a heavy, blunt instrument, such as a cart-wheel, a stone, &c. It is irregular in shape, with much bruising of the surrounding parts. It must be remembered, however, that blunt instruments frequently cause quite a clean cut.

Treatment will be on the same principles as those described above. The danger of sepsis is usually greater, the task of uniting the edges of the wound more difficult, and the constitutional disturbance frequently grave.

In injuries which involve the severe crushing of a limb, the question of amputation will have to be considered. In a hand-book of this type it is impossible to lay down any rule with regard to this question. Each particular case must be decided upon its own merits, having regard to the age and vitality of the

patient; the extent of the injury, especially in its relation to the blood supply; and the presence or absence of sepsis.

Gun-shot and **revolver-shot wounds** are usually placed in a class by themselves. They vary in size and shape according to the variety of bullet employed. Treatment does not differ in principle from that of wounds generally. Obviously the bullet, if present, must, if possible, be removed.

One or two special forms of wounds must be discussed separately:—

Wounds due to the Bites of Poisonous Snakes.—The surgeon's energies in these cases are directed towards preventing the virus introduced by the snake into the local lesion, from reaching the general circulation. A ligature is first tied tightly round the limb, above the bite. The wound is then enlarged by free incisions to induce hæmorrhage; if necessary, a cupping glass may be applied. A speedy outflow of blood tends to remove the virus. When the immediate danger is passed, the wound is treated according to general principles.

Dog Bites.—As a rule, there are no particular reasons for suspecting the dog to be rabid. The application of solid silver nitrate to the wound will suffice. If there is genuine fear that the dog suffered from rabies, the edges of the wound should be freely excised under an anæsthetic. It may be noted that the dog should be preserved until such time as the nature of his disease is fully disclosed.

Burns and Scalds.—Burns and scalds are injuries due to the application of heat. Dry heat causes a *burn*, while moist heat results in a *scald*. There is no great difference in the clinical manifestations of the two types of injury, and they may conveniently be discussed together.

Six different *degrees* of injury have been described, according to the depth of the lesion.

First Degree.—The skin is simply scorched: no destruction of tissue takes place.

Second Degree.—Vesication takes place, that is to say, an exudation of fluid occurs superficial to the cutis vera and beneath the cuticle; the cuticle is thus raised, forming a *blister*.

Third Degree.—The cuticle and part of the cutis vera are destroyed, laying bare the terminations of the cutaneous nerves.

Fourth Degree.—The whole integument is destroyed, including all the glands of the skin.

Fifth Degree.—The injury involves the muscles.

Sixth Degree.—All the tissues, including the bone, may be involved.

The pathological processes which occur are those of inflammation and, if recovery supervenes, subsequent repair. The intensity of the inflammation varies according to the severity of the injury. The severer degrees of burns are almost invariably accompanied by septic infection. This is due to various factors; the skin is rarely clean in a surgical sense, and if burnt clothing, &c., is involved in the wound, the probability of infection is increased. The vitality of the part is also depressed by the injury, rendering the tissues less able to combat a possible bacterial invasion.

The clinical signs are local and general.

The *local signs* in a burn or scald of the first degree are those described under inflammation, *viz.*, pain, redness, heat, swelling (usually slight in amount), and impairment of function. The danger of sepsis is not so great as in the severer degrees. While healing is taking place, there is usually a certain amount of desquamation.

In an injury of the second degree, in addition to these signs, vesication occurs.

When the injury is of the third degree, the inflammatory signs are again present; but as the nerves are laid bare the pain is very much more intense, and part of the true skin being destroyed, the danger of sepsis is greater. Healing occurs by granulation, and is generally rapid. As some of the glands remain intact, the formation of new epithelium begins around these glands as well as at the edges of the lesion. There is very little tendency to subsequent fibrous contraction.

In the more severe degrees the inflammation is more intense, there is greater danger of sepsis, and healing takes place much less quickly. The pain in this case is commonly less severe than in an injury of the third degree.

The whole of the true skin having been destroyed,

a good deal of fibrous tissue is formed in the process of repair, and there is often considerable contraction in the scar.

The *general signs* are those of shock. The severity of the shock depends more upon the superficial extent than upon the depth of the injury. In severe cases the shock lasts about two days. This is followed by a condition of slight fever and general weakness, lasting a variable time. The severity of the febrile symptoms depends mainly upon the degree of sepsis which has occurred. Inflammation of various organs may occur during this stage, the lungs, pleura, meninges or digestive system sometimes being affected.

One complication which is characteristic, though happily rare, is ulceration of the duodenum. The ulcers do not differ clinically or pathologically from the usual form of duodenal ulcer.

The prognosis depends chiefly upon the degree of shock, the position of the injury (it is less grave if the limbs are involved than the trunk), the previous condition and age of the patient, and the degree of sepsis present. Death may occur in early stages from shock or collapse; later on it may result from sepsis and consequent toxæmia, or from any of the complications above mentioned, *e.g.*, duodenal ulcer.

Treatment.—The first essential is to treat the shock, if present. The patient should be kept warm with hot blankets; hot-water bottles may be applied to the feet. Strychnine may be given, and if the pain is very severe, morphia may be required. It may be necessary to give a saline infusion (*cf.* Wounds, p. 42).

The local treatment of a superficial injury, that is, of the first, second or third degree, is first to render the wound aseptic. Blisters should be incised, and the fluid squeezed out. A saturated solution of sodium bicarbonate often relieves the pain. Another method frequently used is to dress the injury with gauze soaked in a solution of picric acid (gr. v. ad. ℥i), or to paint on a mixture of castor oil one part and collodion two parts. This latter dressing causes much smarting pain when applied, but soon affords relief. If there is little or no sepsis, boracic acid ointment forms a good dressing. At the present day the picric acid dressing is most in favour.

In burns of severer degree, great difficulty may be experienced in removing dirt and pieces of clothing, &c., from the wound. The patient should be placed in a warm boracic acid bath (100° F.), and the *débris* allowed to float off. Great care must be taken to ensure that the temperature remains fairly constant. If this measure is not successful, it may be necessary to give a general anæsthetic, and scrape or cut away the dirt, &c. In these conditions, the wound will be best treated by fomentations until it has been rendered aseptic.

In order to hasten healing and prevent fibrous contraction, when a large area of skin has been destroyed, skin grafting should be employed.

In very severe burns of the limbs, the question of amputation may have to be considered.

A scald of the glottis requires special mention, as the great œdema caused often necessitates immediate tracheotomy to save the patient's life. If the symptoms are not so urgent, scarification of the injured area may be tried.

In young children, the inunction of a large quantity of mercury ointment is said by some to have a greatly beneficial effect upon the œdema. Facilities for immediate tracheotomy should, however, be always at hand. Mr. Barker has experienced considerable success with this method. As much mercurial ointment as possible should be used, but to avoid subsequent toxic effects, the skin must be carefully washed afterwards.

Burns due to *lightning* or *electricity* require treatment on general lines, but healing in these cases is commonly slow.

Healing of Wounds.

There are three methods by which a wound may heal: first intention, second intention, and third intention.

Healing by first intention occurs in incised wounds, in which (1) the tissues are healthy; (2) no sepsis is present; (3) the hæmorrhage is completely arrested; and (4) the edges are placed in exact apposition.

In a few hours the edges are held together by a non-vascular, glutinous material. After twenty-four hours this material will have become vascularized. These

newly-formed blood-vessels, however, disappear later, leaving a non-vascular scar.

When examined microscopically it will be found that the process is simply a mild, aseptic inflammation, involving only just the neighbourhood of the injury. All the stages of inflammation occur, hyperæmia, stasis, exudation, and repair. By the cellular exudation and the fibrin, the edges of the wound are first glued together. Loops of new blood-vessels then form in this substance, and so the edges join.

The clinical signs of inflammation are also present in a very slight degree, *i.e.*, redness, swelling, heat, and pain. These usually disappear in twenty-four hours. As soon as the edges have joined the inflammation subsides, but the formation of fibrous tissue continues until a firm, non-vascular scar is formed.

Another variety of healing by first intention is healing under a *scab*. The scab is formed by blood clot, and acts simply as a "dressing," protecting the wound from sepsis or mechanical irritation.

Healing by second intention or **by granulation** occurs when one or more of the factors necessary to ensure healing by first intention is absent. Sepsis may have occurred, a foreign body may be present, the nature of the wound may be such that the edges could not be got into correct apposition, &c.

In this case the signs of inflammation occur as before, but instead of subsiding within twenty-four hours they tend to progress. The discharge increases in amount, and soon suppuration occurs. The granulating surface then heals, as has been described under *Ulceration* (*q.v.*).

Healing by third intention or **by union of two granulating surfaces** occurs in widely gaping wounds, where considerable loss of tissue has taken place. In each of the two surfaces of the wound granulation tissue is formed in the manner described above. The granulating surfaces gradually approach one another until union occurs.

Certain further complications which may be present in a wound require mention.

Sepsis in a wound may cause general, constitutional effects of varying intensity. Three conditions are described, *viz.*, *sapræmia*, *septicæmia*, and *pyæmia*.

Various bacteria may be present in these conditions, streptococci and staphylococci being the most common.

Sapræmia results from absorption into the circulation of toxic products produced by bacteria, the organisms themselves being present *only in the local lesion*. The clinical signs of the condition generally commence about one to three days after infection, with a sharp rise of temperature (102° to 103° F.), often with a rigor. This is associated with a rapid, weak pulse, a dry, furred tongue, headache, loss of appetite, and general weakness. There may be some delirium. As a rule, constipation is present; but if the toxins act chiefly upon the gastro-intestinal tract, severe diarrhœa and vomiting may occur; if this condition be not rapidly treated, collapse and death may follow. When the action of the toxins involves chiefly the central nervous system, the delirium in the early stages is more marked, and is followed by coma. Slight albuminuria is often present.

The *treatment* is to remove the local cause of the disease by opening up and cleansing the wound, and to assist in the elimination of toxic products by purgation and diuresis. Rectal injection or infusion under the skin of normal saline solution is often of great service.

Chronic Sapræmia, or **Hectic Fever**, is a similar condition, the absorption of toxins continuing for a considerable time. The clinical signs are continued pyrexia, and great emaciation and weakness. The long continued presence of toxic substances in the blood tends to produce a type of degeneration known as *albuminoid*, *waxy*, *lardaceous*, or *amyloid* degeneration in the liver, spleen, and other organs.

The *treatment* is similar to that of the acute type.

Septicæmia differs from sapræmia in this particular: that in septicæmia the organisms actually gain access to and multiply in the blood-stream, by which means they are carried to the various organs of the body.

The clinical signs are similar to those of sapræmia, but more marked. There is almost always a definite rigor at the commencement, usually within forty-eight hours of the primary infection, and the temperature is higher, commonly 104° to 105° F.

Pyæmia is really a form of septicæmia in which, in addition to the other phenomena mentioned above, secondary abscesses are formed in various parts of the body. These pyæmic abscesses are most common in the lungs, spleen, liver, kidneys, and brain, but they may occur in any part of the body. Venous thrombosis occurs in the neighbourhood of the local lesion. From the thrombus infective emboli become detached, and, passing round in the blood-stream, lodge in some small vessel; at the points where they lodge, pyæmic abscesses may be formed.

The clinical signs of pyæmia much resemble those of septicæmia. It does not usually begin for a week after primary infection. It is ushered in with a rigor, and throughout the course of the disease rigors occur at intervals (there is rarely more than the rigor at the onset in septicæmia). The temperature remains high, the pulse rapid and weak; persistent vomiting and diarrhœa occur, both the vomit and the stools being frequently bloodstained. Slight jaundice, albuminuria and hæmaturia may be present.

Treatment as before is directed first to the local lesion. All secondary abscesses that can be reached must be opened and cleansed.

CHAPTER VII.

HÆMORRHAGE.

Hæmorrhage is the escape of blood from the vessels. When the blood escapes into any cavity in the body (such as the uterus, &c.), or into the tissues, the hæmorrhage is *internal;* when the blood escapes from the surface of the body, the hæmorrhage is *external.*

The bleeding differs according to the vessel from which it occurs. In *arterial hæmorrhage,* the blood is bright red in colour; it escapes from the proximal end of the vessel in jets, practically synchronous with the cardiac systole. In *venous hæmorrhage* the blood is dark purple in colour; it does not escape in jets, but flows continuously. *Capillary hæmorrhage* occurs as a continuous, slight oozing of blood from the wounded surface.

The bleeding which occurs at the moment of injury is known as *Primary* hæmorrhage. The recurrence of bleeding within twenty-four hours of the arrest of the primary hæmorrhage is termed *Recurrent, Reactionary,* or *Intermediate* hæmorrhage. *Secondary* hæmorrhage is any recurrence of bleeding more than twenty-four hours after the primary hæmorrhage has been arrested.

The *treatment* of primary *arterial* hæmorrhage has already been discussed under wounds (Chapter VI). *Venous* hæmorrhage will in the majority of cases yield to the presence of a dressing. If a large vein has been injured, it may be necessary to dissect out the two ends and apply ligatures.

Capillary hæmorrhage is best treated by the application of pressure: hot water (110° F.) is often useful. If the position of the wound is such that pressure cannot readily be applied, recourse must be had to *styptics* (*see* Chapter VI).

Recurrent or **Reactionary Hæmorrhage** may be due to the breaking down of the clots formed in the injured vessels, by increased blood-pressure; to the

slipping of a ligature; or to the perforation of a damaged vessel. If slight, it may be arrested by elevation of the part, and form pressure on the wound. If this fails, the wound must be explored, and the bleeding vessel sought and tied. When the vessel cannot be sufficiently isolated to admit of the application of a ligature, the actual cautery may be used.

Secondary Hæmorrhage is frequently the result of sepsis. The micro-organisms may gain access either through the external wound or *viâ* the blood-stream. In either case, if the clot in the vessel becomes infected, it softens and is consequently no longer sufficient to withstand the pressure of the blood. Anæmic patients are very liable to suffer from tiresome secondary hæmorrhage. This is often the case after the extraction of teeth.

The principles of *treatment* are the same as above described, *viz.*, in slight cases, elevation of the part and firm pressure; if necessary, operative interference, and ligature of the vessel. In very septic cases, where vessel is too much diseased to hold a ligature, the main artery must be exposed through a fresh incision above the injury, and a ligature applied to it there. In very severe cases, amputation may have to be considered.

Three conditions which resemble one another in their clinical manifestations may present themselves, *viz.*, *Shock*, *Collapse* and *Syncope*.

Shock is a condition of lowering of vitality, following injury or emotional disturbance. It is commonly supposed to be due to a disturbance of the vasomotor centre in the medulla. It varies in degree according to the severity of the injury, the susceptibility of the patient (a so-called "nervous" patient being particularly liable, while children are more susceptible than adults as a rule), and the part injured (injury to the viscera is more likely to produce severe shock than injury to a limb). The extent of the injury also affects the severity of the shock, *e.g.*, a deep burn which is limited in extent is not so likely to cause severe shock as a burn which, though not penetrating deeply, involves a large area of surface.

Intense pain is a factor which tends to increase the severity of shock.

The onset is *sudden*. The patient is in a condition

of extreme weakness, and mental apathy. In the earlier stages, he can generally be roused, and persuaded to answer questions, but later may become insensible. The face is blanched, the respirations shallow and irregular, the temperature subnormal, the pulse weak, irregular and rapid.

The first sign of recovery is usually an attack of vomiting. All the signs then begin to abate; the colour returns, the pulse becomes stronger and slower, the temperature rises, often above normal, and the mental apathy slowly disappears.

Collapse differs from shock in that its onset is not sudden but gradual. It depends upon the withdrawal of large quantities of fluid from the body by hæmorrhage, severe diarrhœa, vomiting, &c. The symptoms and signs are similar to those described under shock, and it should be treated upon similar lines. (*See below.*)

Syncope or **Fainting** results from sudden cerebral anæmia, due to temporary stoppage of the heart. It usually depends upon similar conditions to those described as responsible for shock, *viz.*, severe injury, pain, or emotional disturbance. The signs are similar, but are all compressed into quite a short space of time.

Treatment.—The first thing to do is to place the head lower than the heart to assist the flow of blood to the brain. Then loosen any tight clothing especially round the neck. In order to stimulate the heart ammonia may be held under the nose, or spiritus ammoniæ aromaticus (℥i ad. ℥ss of water) may be given by the mouth if the patient can swallow. Ice-cold water may be thrown in the face. In cases of collapse, a saline infusion may be of great value; an ounce of brandy may be added to the saline infusion. A hypodermic injection of strychnine (liq. strych. hydrochlor. ♏iv), or of ether ♏v, may be given.

If these remedies fail, and the facilities for operation are at hand, actual massage of the heart through an incision below the costal margin may be resorted to.

There are certain terms used in connection with hæmorrhage from certain situations, the meaning of which must be explained.

Epistaxis, bleeding from the nose (*see* Chapter XXIV).

Hæmoptysis, bleeding from the lungs or air passages.

Hæmatemesis, bleeding from the stomach.

Hæmaturia, blood in the urine.

Melæna, the presence of *altered* blood in the motions, the stools being black and tarry. Bright red blood in the motions is not melæna. Information with regard to the last four of these conditions should be sought in text-books on medicine.

CHAPTER VIII.

DISEASES OF ARTERIES AND VEINS.

Inflammation of an artery is called *Arteritis*. It may commence from within the artery, and involve the tunica intima (*Endarteritis*), or it may come from the tissue around the vessel (*Periarteritis*).

Arteritis may be either acute or chronic.

Acute Arteritis is divided according to its cause into *non-infective* and *infective*.

The non-infective variety is a simple inflammatory process by which a vessel is closed up after injury, ligature, or lodgment of an embolus.

The infective form usually follows a septic wound or septic embolus. Signs of acute suppurative inflammation appear in the vessel. It is the most common cause of secondary hæmorrhage (*q.v.*, p. 51). In dental operations this cause does not weigh so heavily as it does in major operations. Aneurism may follow (*q.v.*).

Chronic Arteritis may depend upon a variety of causes, of which the most important are:—Continued high blood-pressure due to renal disease, &c.; the action of certain poisons, notably lead; some general diseases, such as syphilis (perhaps the most frequent), diabetes, tuberculosis (rarely). In old people a calcareous degeneration of the vessels may occur. The changes which are associated with the condition differ somewhat, according to the size of the vessel.

In the larger arteries a proliferation of the intima *in patches*, with a great tendency to fatty, fibroid, or calcareous degeneration, occurs; the media and adventitia are later affected. The later stages of the condition are known as *Atheroma*, and are characterized by extensive degeneration in the walls. Aneurism may result.

In *syphilitic endarteritis*, the smaller arteries are chiefly affected. There is considerable proliferation of the intima; this proliferation is usually not in patches, but involves the whole circumference of the vessel.

The media is thickened to a slight extent; the adventitia rather more. Fatty degeneration is not so common. The condition may progress to complete obliteration of the lumen of the vessel.

Tuberculous arteritis is a similar, but much rarer, condition.

Treatment should be directed towards the underlying cause. All unnecessary strain must be avoided.

An **Aneurism** is a dilatation of a vessel wall, forming a sac filled with blood. It commonly follows syphilitic or other arteritis; severe strains may result in aneurism, but in these cases there is probably always some diseased condition of the wall previously present.

Three types of aneurism are described, *viz.*:—

(1) **Fusiform** — The whole circumference of the vessel is dilated; it commonly follows extensive arterial disease.

(2) **Sacculated.**— A large sac with a small opening communicating with the artery is formed, by the dilatation of a weak patch in the wall.

(3) **Dissecting.**— The blood passes between the coats of the vessel, either between media and adventitia, or in the substance of the media, forming a sac actually *within the wall of the vessel.*

The large arteries of the thorax are the most common situations for aneurism.

The clinical signs are: (1) The presence of a tumour which pulsates. This pulsation is synchronous with the heart's apex beat and is *expansile* in character. Pressure upon the main artery on the proximal side causes the pulsations to cease, and the *tumour becomes smaller,* filling up again, as soon as the artery is released.

(2) A systolic and sometimes also a diastolic murmur is heard over the tumour.

(3) A systolic thrill may be felt.

(4) Signs dependent upon the pressure exerted by the tumour, *e.g.*, enlarged veins, pain or paralysis from pressure on nerves, erosion of bone or soft tissues, &c.

Diagnosis.—This depends chiefly upon the *expansile pulsation.* In tumours which exhibit pulsation transmitted to them by an underlying vessel, the pulsation is not expansile. The pulsation in some sarcomata may be expansile, but these tumours are rarely found

in the line of a large artery. Also, pressure upon the main artery above the tumour, though it stops the pulsation, does not affect the size of the tumour. Considerable pain may result from an aneurism, without very obvious signs; it may then be mistaken for neuralgic pain such as sciatica. A careful physical examination will generally reveal the true condition.

Spontaneous cure is rare. *Rupture* either externally or internally may occur, often with sudden death.

Treatment.—Rest and avoidance of all strain is essential. Antisyphilitic remedies (mercury and iodides) are of extreme importance, *in all cases*, even where no history of syphilis can be obtained.

Various surgical measures have been devised. If a small vessel is involved, ligatures may be applied above and below the sac, and the whole removed.

Where this is impossible, ligatures may be applied without excision of the sac. These procedures are not without danger, owing to the risk of secondary hæmorrhage from the diseased vessel.

Another method is to place a large quantity of gold wire in the sac, and pass an electric current through, for the purpose of inducing clotting. Usually only temporary benefit is obtained, though quite recent results have been more encouraging. Macewen's method of acu-puncture, that is, sticking a number of needles into the sac and leaving them there, to induce clotting, is rarely performed. In the limbs amputation may have to be performed.

A so-called **Diffuse Traumatic Aneurism** is not an aneurism in the strict sense of the word, because the sac into which the blood escapes is not composed of the coats of the vessel, but of the surrounding soft tissues. It follows stabbing injuries; suppuration and rupture may result.

Treatment is to ligature both ends of the injured vessel, and remove the sac.

An **Arterio-venous Aneurism** is an abnormal connection between an artery and a vein. They are mostly traumatic in origin. Two kinds occur:—

An *aneurismal varix* is a direct connection between artery and vein, no sac intervening.

When the two vessels are connected by a dilated sac, the condition is called a *varicose aneurism*. The

venous walls are much dilated by the pressure of the arterial impulse, and are very liable to rupture.

The physical signs are those of a small aneurism.

Treatment is to ligature the artery above and below, and if this fails, the vein also.

Inflammation of a vein is known as *Phlebitis*. Like Arteritis it may be non-infective or infective.

Simple Non-infective Phlebitis may follow injury. It also occurs in conjunction with Thrombosis. Other cases are called *idiopathic*, which is a convenient way of disguising our ignorance as to the cause of the condition. Phlebitis is a not infrequent sequel of Influenza.

Infective Phlebitis may follow actual injury to the vessel, or may spread from an adjacent septic wound. It may also result from the presence of micro-organisms in the blood.

The ordinary signs of inflammation are found in the vein. In the septic variety, suppuration and softening of any clot formed may occur, resulting in the formation of an abscess.

Thrombosis (clotting) is a common accompaniment of phlebitis. The clot may become organized, and the vessel be altogether obliterated, or a canal may gradually be formed, and the flow of blood recommence. Emboliems may be thrown off from the thrombus, and lodge in distant parts of the body. In the infective variety, this is perhaps the chief danger to be feared.

Phlegmasia Alba Dolens or "*white leg*" is a condition of thrombosis spreading from the uterine sinuses to the veins of the lower extremity in pregnancy or after delivery.

Clinical Signs.—If the vein be superficial, it may be felt as a hard, painful, "nubbly" swelling, the skin covering it has a dark bluish appearance, due to the enlargement of the underlying vein. Slight œdema of the area normally drained by the affected vessel may be present, but the venous circulation is so free that this is not as a rule a marked feature, unless a large vein is affected. When suppuration occurs, the swelling does not feel so hard.

When a deeper vein is affected, deep seated pain, tenderness along the line of the vessel, some fever,

œdema, and whiteness of the skin must be relied upon in diagnosis.

Later, Pyæmia may supervene (*q.v.*).

Treatment.—In the non-infective type, absolute rest and immobilization of the part until all signs of inflammation have disappeared, is essential. The part may be painted with glycerine of belladonna and fomented. The dressing should be so arranged that it can be changed without moving the part.

In infective phlebitis, in addition to the above treatment, if abscesses are present they should be opened. Where possible, a ligature placed on the proximal side of the diseased area may prevent the spread of infection. There is some danger in this procedure, as the slight injury to the already diseased vessel wall involved in the pressure of the ligature may be sufficient to determine thrombosis above it. In severe cases involving the limbs, amputation may have to be considered.

Varicose Veins is a condition in which the affected vessels are dilated, lengthened, tortuous, and often thrombosed. The veins of the leg are most commonly affected. The causes of the condition are some inherent weakness of the wall or valves of the vessel, combined with unusual strain, such as long continued standing or severe exertion. The pressure of large abdominal or pelvic tumours offers increased resistance to the return of blood to the heart, and so may cause varicosity. In a similar way, cardiac and hepatic diseases, by interference with the flow of blood, may be responsible for the condition.

Clinical Signs.—The tortuous varicose veins are most commonly superficial, and may be seen and felt. They are usually painful. An impulse and a thrill may be felt on coughing.

Piles are due to a varicose condition of the veins of the rectum.

A *Varicocele* is a similar condition affecting the spermatic veins.

Treatment.—Mechanical support by means of an elastic bandage is often sufficient to allay symptoms. Operative interference may be required. The veins may be divided between two ligatures, or a piece of the vein on the cardiac side excised.

Sepsis requires treatment on general lines. If a varicose vein ruptures, the limb should be elevated and firm pressure applied to arrest hæmorrhage.

Piles should be seized with forceps, ligatured, and removed with scissors, or the actual cautery. A more certain cure can be obtained by removal of the "pile bearing area," that is, the lower part of the rectal mucous membrane (Whitehead's operation). It should be borne in mind that piles are very often manifestations of cardiac or other general diseases.

Varicoceles do not as a rule require any treatment. If they cause pain ligatures should be applied, and as much as possible of the affected vein excised.

Tumours of Vessels (*see* Chapter XIV).

CHAPTER IX.

INJURIES AND DISEASES OF NERVES.

Injuries.—A blow upon a nerve, especially where it is close to a bone, may cause severe pain and a sensation of "pins and needles." There may be slight temporary paresis of muscles. These symptoms usually disappear rapidly without treatment. In persons who are "out of sorts" or by nature hysterical, the symptoms are proportionately more severe. Continued pressure, such as may be caused to the brachial plexus by hanging the arm over a chair, may result in inflammation of the nerve (*see* Neuritis).

Compression of a nerve from a tumour, involvement in callus after a fracture, or in the scar tissue following a wound, results in progressive pain and muscular weakness in the area supplied by the nerve.

Treatment is to remove the cause, by operation if necessary.

Partial or **complete division** of a nerve may occur; the nerve may either be torn or cut across. It is rare for an injury caused by tearing to result in complete division. If the severance is complete the distal portions of the axis-cylinders degenerate. From the proximal portions, new processes grow out. If no septic infection occurs, and the cut ends of the nerve are in apposition, regeneration of the nerve commonly takes place, but the process is slow. The signs of complete division of a mixed nerve are anæsthesia over the corresponding area of skin, paralysis and wasting of the muscles supplied, and trophic lesions of the skin, sometimes terminating in dry gangrene.

Treatment.—If the nerve is a small one, no treatment is required. In the case of a large nerve the cut ends should be immediately sutured together with aseptic precautions. More elaborate operations such as *nerve-grafting* (that is, inserting a piece of healthy nerve between the divided ends of the injured one, and sutur-

ing at both points) or *nerve anastomosis* (suturing the distil end of the injured nerve to the proximal end of some other similar healthy nerve) have been employed. After any of these operative procedures, a course of massage and electrical treatment will be required.

Diseases of Nerves.

Inflammation of a nerve is called *Neuritis*. It may be acute or chronic.

Acute neuritis may follow injury, septic infection from a wound, and certain general conditions, notably gout, rheumatism, and alcoholism.

The symptoms are severe pain along the line of the nerve, and over the cutaneous area it supplies, with some muscular weakness.

Treatment should include rest of the part involved. Glycerine of belladonna fomentations may be applied to relieve the pain. A proprietary article sold under the name of Antiphlogistine applied hot as a plaster is often of great use. Electrical treatment and massage may be required. Bromides may be useful.

Chronic neuritis may result from injury or compression, from syphilis, gout, rheumatism, or diabetes; from the action of certain poisons, notably lead, arsenic, and alcohol, and following certain acute specific fevers, *e.g.*, diphtheria, influenza, &c. There are certain tropical complaints, of which neuritis is a feature, but these are outside the scope of the present work.

The Symptoms are much the same as in the acute variety: Tingling sensations and pain, anæsthesia (sometimes preceded by hyperæsthesia) and paresis or paralysis of muscles.

Treatment.—The underlying cause will require to be dealt with. The part must be kept absolutely at rest, and massage, electrical treatment,* ionization, &c., may be tried. Recovery is often very slow. In certain purely sensory nerves, it may be possible to excise a piece of the nerve completely, above the lesion, and so relieve the pain by interrupting the path of sensory impulses.

* An electrical method of treatment by which certain ions are introduced locally into the affected tissues.

Anodynes such as aspirin and phenacetin may be given, or in very severe cases morphia may be required.

Tumours of Nerves (*see* Chapter XIV).

Diseases of Individual Nerves.—The local manifestations of neuritis vary, of course, according to the particular nerve or nerves affected by the disease. Space compels us to confine our attention to a few of the more important nerves, and phenomena included within their sphere of influence.

The anatomical course of the nerve, and its muscular and sensory distribution, combined with knowledge of the general features of neuritis as set forth above, should enable the student to form a pretty clear idea of the phenomena likely to present themselves in any given case. Certain nerves, notably the fifth and seventh cranial, are of special importance in dental practice, and must be dealt with in some detail.

The **Trigeminal** or **Fifth Cranial Nerve** may be the site of severe neuritis, remarkable for the intensity and paroxysmal character of the pain caused, and known as *Tic Douloureux* or *Epileptiform Tic*. It is commonly due in the first place to irritation of the nerve supplying a tooth. The disease begins as a rule in a single branch, often the inferior dental, infra-orbital or supraorbital. Thence it may spread, sometimes rapidly, sometimes slowly to involve part or more rarely the whole of the remainder of the nerve. In most cases, one division, at least, escapes altogether.

The pain is typically paroxysmal in character; the onset is sudden, each paroxysm lasting from a few seconds to two or three minutes, the pain being of extreme severity. The tendency of the disease to begin in a single branch, and spread to others is reproduced in the individual paroxysms. The pain is usually accompanied by increase of secretions, such as sweating, lachrymation, and increase of nasal secretion, all of which are limited to the affected side.

Anæsthesia over the cutaneous area supplied may be present, but is not a constant feature.

Weakness and wasting of the muscles is generally slight, and therefore immaterial; unilateral ptosis (*see* Chapter XXIX) may occur. Herpes (*see below*) may be present.

Certain *tender spots*, at points where affected branches pass through bony notches or foramina, may

be discovered, the most common points being at the supraorbital notch, and the malar foramen. It should be noted that these are points where the anatomical conditions prohibit the expansion of the nerve, and consequently pain results.

Treatment.—In the early stages, treatment on the lines suggested above should be pursued. In severe cases, however, the pain is of so agonising a character that extreme measures are rendered necessary. Drugs are not, as a rule, sufficient in themselves, though in some cases great benefit has been obtained by the use of full doses of tinct. gelsemii (xv minims three times a day), care being taken to avoid the onset of toxic symptoms due to the drug.

The use of ammonium chloride in doses of 5 gr. every fifteen minutes for an hour often has considerable effect upon the pain. Morphia may also be required.

The benefit obtained by any of these methods is rarely more than transitory, and in severe cases operative interference is generally required. The injection of alcohol into the nerve sheath may give great relief for a time, but the pain commonly recurs. The only operative measure which gives any real hope of lasting cure is the removal of the Gasserian ganglion. There are certain disadvantages connected with its performance, *viz.*, the operation is a difficult one to perform, the shock is often considerable, and trophic lesions in the eye on the diseased side are apt to result if great care is not taken. It is usual nowadays to stitch the upper lid to the lower before commencing the operation. Rose has successfully removed the lower half of the ganglion, in cases where the ophthalmic division is unaffected, in order to avoid the danger of these trophic eye lesions.

The Seventh Cranial Nerve is commonly affected by disease, resulting in the condition known as facial palsy. This may arise from a variety of causes, of which the most frequent are: *exposure to a draught*, the resulting condition being often called rheumatic neuritis, and *middle-ear disease*. Other less frequent causes are fracture of the skull, the pressure of tumours, or of intracranial hæmorrhage, disease of the temporal bone, and certain diseases of the central nervous system, such as tabes or disseminate sclerosis.

Alcoholic facial neuritis is rare. Another cause is injury, especially to the facial nerve of a child when delivered by forceps. The nerve may be attacked in any part of its course, the clinical phenomena varying according to the position of the lesion.

The nerve consists of an upper and a lower motor neuron. The latter includes the whole course of the nerve from the facial nucleus in the pons, to the final branches of supply to the facial muscles; while the part of the nerve above the facial nucleus is known as the upper motor neuron. When the *upper motor neuron* is affected, the muscular paralysis is commonly limited to the *lower part* of the face, on the *opposite side* to the lesion. Emotional movements are affected to a less extent than voluntary movements. There is no muscular wasting, nor are the electrical reactions of the muscles affected. The tongue is often involved as well. Weakness of the limbs *on the same side as the facial palsy* may also be present. The most common causes of this type of facial palsy are intracranial hæmorrhage or neoplasm.

The clinical signs of a *lower motor neuron* lesion of the facial nerve shew several important differences from the condition described above. The paralysis is on the *same side* as the lesion, involves the upper and lower halves of the face equally, and affects emotional just as much as voluntary movements. The facial muscles shew wasting and reaction of degeneration. If the limbs are affected, the weakness is on the *opposite side* to the facial palsy.

From these points, it may be determined whether the lesion is involving the upper or lower motor neuron. The lower motor neuron, however, has a long and complicated course, and it is important to be able to decide in what part of this course the lesion may be.

If the nerve be affected before it has left the pons, in addition to the ordinary features of a lower motor neuron lesion, other cranial nerves are commonly affected, notably the sixth nerve, paralysis of the external rectus muscle of the eye, followed by an internal squint, resulting. Taste and hearing are not affected.

When the position of the lesion is between the point

where the nerve leaves the pons, and the geniculate ganglion, hearing is commonly affected owing to involvement of the eighth nerve. Taste is unaffected, and other cranial nerves are unlikely to be involved.

When the lesion is in the Fallopian canal, the sense of taste is lost over the anterior two-thirds of the tongue, owing to involvement of the chorda tympani. The auditory nerve is not, as a rule, affected. If the lesion be above the point where the branch to the stapedius is given off, this muscle will be paralysed, and in consequence of this, low notes will be heard better than usual, owing to over-action of the now unopposed tensor tympani. This is a physical sign, the presence of which is by no means easy to determine.

Lastly, the nerve may be affected after its exit from the stylomastoid foramen. This is the most common type, and is known as "*Bell's Palsy*." It results in wasting and paralysis of the facial muscles without any affection of taste, hearing, or of the other cranial nerves. The patient is unable to perform any of the movements depending upon the use of these muscles on the affected side, such as smiling, frowning, closing the eye, whistling, &c. Mastication is interfered with, and food tends to collect between the teeth and the cheek on the affected side. The natural wrinkles are smoothed out upon the side of the palsy. The tongue is not affected.

It will be seen that all the points of difference described depend upon the anatomical course and relations of the nerve, and a knowledge of anatomy will therefore enable the student to work out for himself the clinical picture likely to be present in any given case.

The following tables may be of assistance:—

TABLE I.

Upper Motor Neuron.	*Lower Motor Neuron.*
Paralysis of opposite side of face—	Paralysis of same side—
Lower half of face chiefly affected.	Upper and lower halves equally affected.
Emotional movements not affected.	Voluntary and emotional movements equally affected.
No muscular wasting.	Muscular wasting.
No change in electrical reactions.	Reaction of degeneration.
Limbs on same side of face may be involved.	Limbs on opposite side of face may be involved.

TABLE II.

Lower Motor Neuron.

In pons	Between pons and geniculate ganglion	In Fallopian canal	Outside stylomastoid foramen
Hemiplegia on opposite side to facial palsy may occur.	None.		
Other cranial nerves affected, especially sixth.	Not as a rule.	Not affected.	
Not affected as a rule.	Eighth nerve usually affected.	Not as a rule.	Not affected.
Taste unaffected.		Taste affected.	Taste unaffected.
Not affected.		May be hyperacuity of hearing to low notes if lesion above branch to stapedius.	Not affected.

The prognosis of the condition depends almost entirely upon the cause of the lesion. The rheumatic cases as a rule clear up completely under treatment, whereas those due to the pressure of tumours or general nervous disease have a relatively bad prognosis.

The treatment of the condition consists in the removal of the cause. In the rheumatic cases, treatment upon the lines laid down under Neuritis (*see* p. 62) should be pursued; any removable source of irritation, such as an inflamed gland or diseased tooth, should be dealt with.

In cases due to middle-ear disease, suitable operative measures must be employed.

Nerve anastomosis has been undertaken with some success.

Facial Spasm, or **Facial Tic**, is a condition of spasm of the muscles supplied by the facial nerve. It may be due to peripheral irritation, such as dental disease, inflamed glands, &c., to emotional disturbance, such as grief, fright, &c., or to pressure upon the nerve at the base of the skull by a tumour. In some cases no cause can be discovered to account for the condition. The spasms are usually clonic in character, and may in-

volve some or all of the facial muscles. The orbicularis palpebrarum is perhaps most frequently affected, while the digastric, stylohyoid and orbicularis oris often escape. The spasms are usually unilateral and unaccompanied by pain or tenderness.

Diagnosis.—It is important to differentiate those cases in which some gross organic lesion, such as a neoplasm, is present from those due to simple irritation. In the former case the spasm is almost always accompanied by some weakness and wasting of the muscles involved, and the limbs are usually affected as well as the face.

At first glance, a facial spasm on the right side may be mistaken for a left facial palsy. On examination, however, it will be found that the apparently palsied side moves perfectly well.

The treatment, of course, is to remove the cause, if it can be discovered and is removable, and attention must be paid to the general health. Drugs are not usually of value, but bromides, combined with arsenic, may be useful. Electrical treatment is the most successful method, as a rule. Nerve stretching rarely gives more than temporary benefit.

The Hypoglossal, or Twelfth Cranial Nerve, may be affected by similar causes to those described above. Wasting and weakness of one side of the tongue results, so that the tongue when protruded points towards the paralyzed side. This is more often due to intracranial than to peripheral causes, and may form part of a hemiplegia. If the upper neuron is affected wasting will not occur, and the electrical reactions will remain unchanged.

Treatment must be directed towards the underlying cause.

The spinal nerves may be affected in similar ways, the symptoms depending upon the anatomical course and distribution of the nerve involved. Treatment should be carried out on similar lines to that described above.

Herpes Zoster, or **Shingles**, is a condition the physical signs of which make their appearance in the skin. The causative lesion, however, is a hæmorrhage into the posterior root ganglion of the nerve or nerves of supply to the area of skin affected. Acute pain is

felt along the course of the nerve. This is followed by some hyperæmia of the affected area of skin. After a day or two, groups of greyish yellow vesicles make their appearance. These gradually dry up and disappear after about ten days. The adjacent lymphatic glands are often enlarged. In certain cases no pain whatever is present, but as a rule it is severe. The appearance of the skin lesion, and its limitation according to the cutaneous nerve supply, should be sufficient to make the diagnosis of the condition simple.

Treatment chiefly aims at the relief of symptoms. The part should be protected from irritation; calamine lotion or boracic powder dusted over is often useful.

Counter irritation to the nerve trunk by means of iodine, blistering, or Antiphlogistine may be used.

Aspirin or phenacetin may be given for the pain, or, if necessary, morphia. Full doses of tinct. gelsemii may do good.

CHAPTER X.

DISEASES OF THE LYMPHATIC SYSTEM.

Lymphatic Vessels.—*Lymphangitis*, or inflammation of the lymphatics, may be acute or chronic.

Acute lymphangitis is almost invariably the result of septic infection from a wound. The wound may be of the most trivial character, such as a cut finger, or an abrasion caused by the rubbing of an ill-fitting boot. The condition is characterized by the presence of red lines running along the course of the main lymphatic vessels of the part, and associated with pain and swelling of the lymphatic glands into which the affected vessels drain. As a rule, the infection does not spread further than the nearest glands, but in rare cases general septicæmia may result. If a large number of lymphatics in a limb are affected, the separate red lines may not be distinguishable, the whole limb being red and painful. The temperature is generally slightly raised.

Treatment.—First remove the cause; that is to say, thoroughly purify the wound and render it as far as possible aseptic. Keep the limb at rest, and apply hot fomentations. Administer a purge, such as pil. hydrarg. gr. v at night, followed by a saline in the morning. When the glands are very painful, but not suppurating, a glycerine of belladonna fomentation may give relief. If suppuration occurs the abscess must be opened, the pus evacuated, and fomentations applied.

Chronic lymphangitis usually occurs as a sequela of the acute condition, in which case it is treated on similar lines. Syphilitic lymphangitis occurs most commonly during the primary stage of the disease, and affects chiefly the lymphatics of the penis. It should be treated by antisyphilitic remedies.

Tuberculous lymphangitis also occurs, but is not common.

Elephantiasis is a chronic hypertrophy of skin and subcutaneous tissue, due to some obstruction to the lymphatic circulation. Two varieties are described:—

Elephantiasis Arabum.—In this condition the lymphatic obstruction is due to a parasite, the *Filaria sanguinis hominis*. It is not necessary to deal further with this condition.

False Elephantiasis.—Any chronic obstruction, such as the pressure of a tumour or glandular disease, may be the cause.

The treatment is difficult and tedious. The limb should be kept elevated, and an elastic bandage applied. Certain ingenious operations have been devised, which have afforded relief in some cases. *Lymphangeioplasty* is the formation of an artificial anastomosis between the lymphatic vessels and the venous circulation of the part. Artificial lymphatics have also been formed by means of sterilized milk.

A lymphangeioma is a new growth, consisting of lymph spaces communicating with one another by means of lymphatic channels, which may either be normal lymphatics dilated, or newly-formed channels. They are usually either present at birth, or appear soon after. Three kinds of lymphangeiomata are described, though the differences between them are merely those of degree:—

(1) **A capillary lymphangeioma** (lymphatic nævus) consists of new-formed lymphatics, not sufficiently dilated to form cysts. They may be removed either by excision, or by means of the electric cautery.

(2) **A cavernous lymphangeioma.**—There are a large number of cysts connected together by lymphatics. Clinically, they appear as small vesicles, most commonly upon the scrotum, and somewhat resembling Herpes, from which, however, they are distinguishable by the absence of any inflammatory redness of the surrounding skin. They should be treated by excision.

(3) A **cystic lymphangeioma**, or **cystic hygroma**, is a tumour usually of considerable size, and containing one or two large cystic spaces, which do not always communicate. The most common situation for these tumours is about the side of the neck.

The *treatment* is removal. The operation may be extremely difficult, as these tumours often extend deeply, and their removal involves considerable dissection.

Macroglossia is a congenital condition, in which the tongue is enlarged by obstruction to the flow of lymph,

associated with hyperplasia of the connective tissue. The tongue is at first soft, but is very liable to become inflamed; after two or three attacks of inflammation it may become quite hard.

Treatment.—Electrolysis should be tried first. If this fails, operative measures (*e.g.*, the removal of a V-shaped portion of the tongue) will be required.

Macrocheilia is a similar condition involving the lip. Both lips may be affected, but the lower lip is most frequently involved. It is much increased in size, and hangs down. In this condition superficial ulceration of the mucous membrane frequently occurs.

Treatment.—Electrolysis may be tried. Excision of the affected lip will usually be required.

Lymphatic Glands.

Lymphadenitis, or inflammation of a lymphatic gland, may be acute or chronic.

Acute lymphadenitis results from the same conditions as acute lymphangitis, namely, some septic focus which may be quite trivial. The glands in the neck and axilla are commonly affected, the disease following on such conditions as discharge from the ears, *oral sepsis*, or pediculosis. Lymphadenitis may also occur as a complication of most of the acute specifics, notably, scarlet fever.

The disease is characterized by rapid swelling of the gland, accompanied by pain, tenderness, redness of the skin, and usually some fever. Suppuration often follows.

The treatment is similar to that described under lymphangitis. Remove the septic focus on which the disease depends, open the abscess, evacuate the pus, and foment.

Chronic lymphadenitis is due to some chronic irritation. This irritation may be of the kind described above as causing the acute variety, giving rise to a *simple* chronic lymphadenitis, or it may be tuberculous or syphilitic.

In the simple variety the glands are swollen and tender; they are not adherent as a rule, and do not commonly suppurate.

Treatment should include rest and counter-irritation, such as painting with tincture of iodine. If suppura-

tion occurs fomentations must be applied, and as soon as possible the pus must be evacuated.

Chronic tuberculous lymphadenitis is a much more common condition, especially in children and young adults.

Among predisposing causes may be mentioned overcrowding of population and bad or insufficient food. Glands which are already the seat of a simple chronic inflammation are very prone to become tuberculous, so that careful watch must be kept on these cases.

The glands in the neck are perhaps most commonly the seat of tuberculous disease, especially those situated in the anterior triangle.

The clinical manifestations are very varied. In some cases the glands are small and hard, with little or no periadenitis (inflammation around the gland), and often no signs of softening until the late stages of the malady. The diagnosis from lymphadenoma (*q.v.*) may be difficult in this type of case. In other cases the glands rapidly increase in size, tending to soften and suppurate early; there is much periadenitis, the glands adhering together to form large masses. Abscesses often point and discharge on the surface, thus forming sinuses. The diagnosis in such a case presents no difficulty: it is obviously tuberculous. Between these two extremes there are many clinical varieties, but the chief point to remember is that, in the great majority of instances, suppuration occurs.

Treatment in most cases must be operative. When, however, the glands are small, discrete (not adherent to one another), and not rapidly increasing in size, the diagnosis being perhaps doubtful, it may be justifiable to delay operation and to try the effect of other treatment. Complete rest of the affected part must be ensured, and all local sources of irritation removed. Plenty of fresh air and good food is essential. Arsenic may be administered. It is well to begin with small doses, such as liq. arsenicalis iij minims, which may be gradually increased up to viij minims or more three times a day. Injections of tuberculin have also been tried. If no improvement results from this treatment, operation must not be long delayed—not longer than about three months. If suppuration occurs, or if there is any rapid increase in size in the glands, immediate operation is indicated.

It is essential that the operative measures, when employed, should be as thorough as possible, even though, as is often the case, very deep dissection is necessary to remove the glands completely.

Syphilis may affect the lymphatic glands in any of its three stages. (*Vide* Syphilis, Chapter XII.)

Lymphadenoma.—This disease is most commonly met with in young adult males; women are much less frequently affected; it is occasionally met with in children.

The clinical signs of the malady are: increase in size of the lymphatic glands all over the body, but chiefly those in the neck and groin, associated with enlargement of the spleen, and often of the liver also.

The glands at first are softish, discrete, and painless; later, they become harder and coalesce. They do not suppurate.

Diagnosis.—The presence of *several* groups of enlarged glands, the enlarged spleen, and the absence of suppuration are the points to be relied on in differentiating between this condition and tuberculous disease. The fact that there is no infiltration of surrounding tissues and the slow increase in size of the tumour are points in favour of lymphadenoma as opposed to lymphosarcoma. Microscopical examination may be necessary in doubtful cases.

Treatment.—Treatment on general hygienic lines, similar to those laid down in discussing tuberculous glands, should be employed. Gradually increasing doses of arsenic should be given. Salvarsan ("606") has been tried, but opinions are divided as to its value. Operative treatment is of no value, as recurrence always takes place.

A **Lymphosarcoma** is a rapidly growing, malignant tumour; microscopically it resembles very closely a small round-celled sarcoma. At first it is usually painless, but later becomes tender, and causes pain from pressure. It rapidly infiltrates surrounding tissues, and sooner or later involves the skin. Secondary deposits occur in neighbouring glands.

The only hope of relief lies in immediate and complete extirpation, but recurrence is common.

Secondary Carcinomata are common.

Secondary Sarcomata are very rare, except lymphosarcomata. (*Vide supra.*)

CHAPTER XI.

DISEASES OF DUCTLESS GLANDS.

For the purpose of this handbook only two of the ductless glands need claim attention, *viz.*, the thyroid and the pituitary body.

Diseases of the Thyroid Body.

Congenital absence of the thyroid body results in a curious condition known as **Cretinism**; atrophy of the thyroid results in **Myxœdema.** Both these conditions, especially the former, have been successfully treated by the administration of thyroid extract. For a description of cretinism and myxœdema a larger text-book should be consulted.

Acute thyroiditis is a rare condition, usually traceable to rheumatism, exposure to cold, or to septic infection.

The thyroid is slightly enlarged and painful, the skin over it red and inflamed; there may be some difficulty in swallowing. Severe constitutional disturbance may occur, especially when in the septic variety suppuration supervenes.

Treatment.—A glycerine of belladonna fomentation should be applied locally; a smart purge should be administered, and in rheumatic cases sodium salicylate should be given. If suppuration occurs, the abscess should be opened at once.

A non-inflammatory enlargement of the thyroid body is spoken of as *goître*, or *bronchocele*. There are several varieties, and they are difficult to classify on account of the resemblance between them.

First, they may be divided into two classes:—

(i) Enlargements of the gland as a whole.

(ii) Tumours in the substance of the gland.

These two types of enlargement are frequently co-existent in the same patient. It will be convenient, however, to describe them separately.

(i) **Enlargement of the gland as a whole.**

(*a*) **Simple Parenchymatous Goitre.**—In this condition there is a general enlargement of the thyroid, in which all the tissues of the gland participate. (It may be confined to one lobe.) In some cases this enlargement is accompanied by marked increase in the quantity of colloid material present. These cases are called *Colloid Goitres*.

The enlargement of the gland is found to be uniform, rather soft, and free from pain and tenderness. The surface of the tumour is smooth, unless adenomata are present as well. Various symptoms may arise from pressure of the tumour upon neighbouring structures, *e.g.*, dysphagia from pressure upon the œsophagus, aphonia from irritation of the recurrent laryngeal nerve, or dyspnœa if the trachea be pressed upon. In the later stages the superficial veins running over the tumour may be enlarged, and cystic degeneration may occur in the tumour.

Treatment.—In the early stages attention must be paid to the general health, and potassium iodide may be administered, commencing with gr. iii, and gradually increasing the dose up to gr. xv, if no toxic symptoms are caused. Thyroid extract is rarely of any value. If this treatment fails to check the disease, operative treatment, *i.e.*, *Hemithyroidectomy* (removal of half of the gland) may be required.

(*b*) **Exophthalmic Goitre,** or Graves's disease, is a condition in which uniform enlargement of the thyroid gland is associated with exophthalmos (protrusion of the eye), and certain other characteristic symptoms.

The disease often follows some sudden nervous shock, and is probably due to increased secretion from the gland. Women are more often affected than men, the typical patient being a girl of from 18 to 25.

The thyroid enlargement is usually uniform and soft, the tumour varying considerably in size. It is rarely painful. In some cases adenomata occur as well, giving rise to an irregular enlargement. Cases also occur in which the thyroid is small in size and hard in consistence, but this is uncommon.

The chief signs of the disease, in addition to the thyroid tumour, are:—

Exophthalmos, of prominence of the eyeballs. Usually this is quite obvious from looking at the

patient, but there are certain signs which confirm it. If the patient is told to look at the surgeon's finger, held about a yard away, and then the finger is slowly moved downwards, it will be found that, though the patient's eyes follow the finger, the upper lids lag behind in a characteristic manner. This is known as von Graefe's sign.

Tachycardia (increased rapidity of the heart's action). —This is often considerable, and may be a most distressing feature of the malady, giving rise to severe palpitations.

Fine tremor of the fingers is frequently present.

These four signs—Thyroid enlargement, Exophthalmos, Tachycardia, and Tremor—are known as the four cardinal signs of Graves's disease.

In addition to these four cardinal signs, there is usually considerable nervousness and excitability, sleeplessness, and slight anæmia. Amenorrhœa may be present.

Treatment.—At first the treatment should be medical, and should include rest, absence of worry and anxiety, as far as possible, and avoidance of all excitement. Drugs may be prescribed as the symptoms demand, *viz.*, iron and arsenic for the anæmia, digitalis (dose 5 to 10 minims) if the tachycardia be extreme, and bromides for the sleeplessness. Thyroid extract does harm, not good, and should not be given. In obstinate cases, hemithyroidectomy has been performed with some success.

Enlargement of the thyroid is of grave significance in regard to the administration of a general anæsthetic, and should always be brought to the attention of the anæsthetist.

(ii) Tumours in the Gland.

(*a*) **Adenomata** may be single or multiple. Their presence may be recognized by the irregular, nubbly feeling of the gland, but in all cases where there is considerable enlargement of the gland the adenomata will probably be found to be associated with colloid goître.

Treatment is always operative. Single adenomata may be shelled out, but when multiple, hemithyroidectomy will usually be required.

(*b*) **Carcinoma** of the thyroid occurs as a rapidly

growing, extremely hard tumour with an irregular surface, which usually ulcerates early. The surrounding tissues are rapidly infiltrated by the growth, while severe symptoms usually result from pressure of the growth upon neighbouring organs. Cachexia is usually marked, while secondary growths are formed early, the long bones being a frequent seat of secondary deposits.

Treatment.—In very early stages it may be possible to extirpate the whole of the growth, but as the whole gland must be removed for the treatment to be of any value, myxœdema will supervene unless the patient be treated with thyroid extract for the rest of his life.

In later stages treatment is solely directed towards the relief of symptoms. Tracheotomy may be required if dyspnœa is severe.

(*c*) **Sarcoma** is not so common as carcinoma. It is most usually unilateral, and is of a very rapid type. Operative treatment is required, as in carcinoma.

Diseases of the Pituitary Body.

The only disease known to be connected with this gland is *Acromegaly*. Our knowledge of this malady has been considerably increased by the recent researches of Professor Arthur Keith. It is only possible here to touch upon the subject quite briefly, but those students who desire a fuller acquaintance with the disease will be amply repaid by studying Professor Keith's paper, published in the *Lancet* of April 15, 1911, free use of which is made in the following pages.

Acromegaly is a disease characterized by overgrowth of the bones in various parts of the body. Its chief interest to dental students lies in the great changes which take place in the lower jaw.

It has been shewn that the malady depends upon some abnormal condition of the pituitary body. Acromegalic skulls show by the enlargement of the pituitary fossa that the glandular portion must have been the seat of a tumour, the size of the enlargement varying in different skulls.

The bony changes which occur appear to be dependent upon a hypersecretion from the enlarged pituitary body.

The physiological function of the glandular portion has been shewn by Professor Keith to be connected with the normal growth of the skeleton. The pituitary secretion acts upon the osteoblasts; it does not actually stimulate them into activity, but it makes them sensitive to certain other stimuli, namely, increasing muscular development. The actual stimulus to bony growth comes from the muscle, but the pituitary secretion is required in order that the osteoblasts may be ready to respond to this stimulus.

Normally, when adult life is reached, bony growth practically ceases. In the disease under discussion the pathological condition present in the pituitary body starts the process again. The overgrowth that occurs in the bones in acromegaly is an overgrowth of *normal* bone laid down by means of the *normal* process; it occurs in the places where, from the foregoing pages, it would be expected to occur, *viz.*, in positions affected by muscular traction, which has been said is the *normal* stimulus of bony growth.

Professor Keith also shews that there is considerable resemblance between acromegalic skulls, skulls of the Neanderthal type, and those of the anthropoid apes, especially the gorilla. He suggests that there is strong reason for supposing that a condition of hyper-pituitarism, *i.e.*, hypersecretion from the pituitary body, was present in the Neanderthal man and still is so in the gorilla.

What the cause of this abnormal enlargement of the pituitary body may be remains at present a mystery. It is known that the pituitary secretion can be increased by castration and thyroidectomy, and that it is increased during pregnancy.

Changes in the Mandible.—Considerable overgrowth takes place in the lower jaw, especially affecting the ascending ramus, which is narrowed and elongated, so that the angle is depressed and the chin pushed forward; there is also new bone formed in the region of the chin. Growth also occurs at the coronoid and condylar processes. Thus it will be seen that *growth occurs at points exposed to muscular traction.*

Changes in the Temporomaxillary Joint.—Growth occurs in the glenoid cavity, its floor being thickened and filled up, so as to bring it almost level with the articular eminence.

Many other changes occur, both in the bones of the head and of the limbs, especially in the extremities, that is, the fingers and the toes, but the foregoing will suffice to show the general result.

The patient usually suffers from headache, neuralgic pains, and lassitude, and is often weak-minded.

Treatment.—Operative treatment for the removal of the glandular portion of the pituitary body has been recommended. But every experimental operation of this nature upon animals has proved fatal.

Apart from operation, treatment must be merely symptomatic. Antipyrine, caffeine, or even morphia, may be required for the relief of the pain.

Pituitary extract has been given without success. Indeed, if the disease be due to hypersecretion from the gland, further injection of the extract of that gland would not appear likely to have beneficial effect. Thyroid extract has also been given, without any marked benefit.

CHAPTER XII.

SPECIFIC INFECTIVE DISEASES.

Erysipelas.

Erysipelas is an infective disease, involving chiefly the skin and mucous membrane.

Considerable differences of opinion have existed as to whether the micro-organism to which the disease is due is a specific bacterium or whether it is identical with the *Streptococcus pyogenes*. At one time several important differences were said to exist between the two organisms, and a special name, *S. erysipelatis*, was given to the erysipelas organism. Nowadays, the majority of observers are of opinion that the so-called *S. erysipelatis* is merely *S. pyogenes* of a particular degree of virulence. The differences in the clinical manifestations of the two infections are, however, sufficient to justify the inclusion of erysipelas for descriptive purposes among the specific infections.

The streptococcus grows readily on all the ordinary media, stains well with simple stain and by Gram's method. In the great majority of cases, an obvious though often quite small wound is present through which infection occurs. In a few instances a so-called idiopathic variety occurs in which no wound can be detected. In all probability infection in these cases occurs either through an undetected wound, or else through one of the hair follicles. It is significant that the great majority of cases of idiopathic erysipelas occur on the scalp.

The incubation period is short, *viz.*, a few hours to three days. The early symptoms are of the common febrile type, such as headache, malaise, general aching pains, slight fever, and sometimes a slight rigor. The pulse is generally full, the tongue dry and furred, and the bowels constipated.

The wound, if present, has an unhealthy appearance, and after about twenty-four hours a rash appears which spreads outwards from the edges of the wound.

The rash is bright red in colour, and disappears on pressure; the edges are slightly raised. There is a sensation of burning irritation in the part. There is not, as a rule, much œdema, except in certain situations which favour it, such as the scrotum, eyelids, &c. As the rash spreads outwards it disappears from the centre, often with fine desquamation. The neighbouring lymphatic glands are frequently enlarged, and red lines are often seen along the course of the lymphatic vessels.

In severe cases, especially when the scalp is affected, there may be high fever and delirium.

Sometimes the subcutaneous tissues are involved in the infection, diffuse suppuration taking place. This condition is termed *cellulo cutaneous* erysipelas.

Suppuration and great œdema frequently accompany facial and scrotal erysipelas.

Infection may spread by means of the veins to internal organs. Notably is this the case when the head or face is affected, the meninges being then in great danger.

The diagnosis is usually easily made from the appearance and mode of spread of the rash and the rapidity of onset.

Ophthalmic Herpes is often mistaken for facial erysipelas. If it is borne in mind that ophthalmic herpes is *always unilateral* and facial erysipelas *always bilateral* this mistake will not be made.

Treatment.—The patient should be isolated; if in hospital, separate nurses and dressers should be told off to attend the case. To prevent the spread of the disease on the surface, a ring of iodine liniment, or nitrate of silver ℈ss ad. ℥i should be painted round on the *healthy skin*, just beyond the edge of the affected area. A dressing of ichthyol ointment, frequently applied, seems to give the best results. Antistreptococcic serum has been used, but the results have not been encouraging.

Quinine should be given in doses of gr. iij three times a day, and saline purges for the constipation. Tinct. ferri. perchlor. in doses ℈ss three times a day is said to have a specific action.

Plenty of nourishment should be given.

Where suppuration has occurred, especially in the

cellulo-cutaneous form, free incisions should be made and fomentations applied.

When the fauces are involved, frequent spraying of the part with liq. sodæ chlorinatæ ʒss ad. ʒi is useful. Tracheotomy may be required, if there is much œdema.

Tetanus.

The direct exciting cause of tetanus is infection by the *Bacillus tetani* (fig. 8). It is a slender, rod-shaped organism, about 4 μ to 5 μ in length. It is motile, and possesses numerous flagella at both ends and at the sides. It stains with simple stains, and by Gram's method. It is an anaerobic organism, it grows well on the ordinary culture media if oxygen

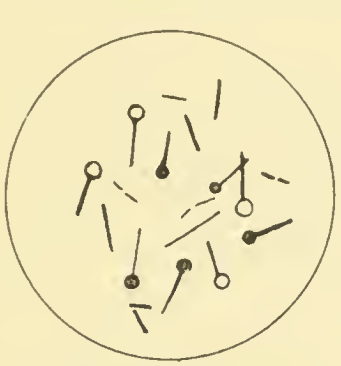


Fig. 8.—Bacillus tetani (shewing spores).

be excluded. It forms spores, which are placed at one end, giving the bacillus a characteristic appearance which has been likened to a drumstick. These spores are very resistant to antiseptics; boiling for five minutes is not always sufficient to destroy them. Some abrasion of the skin is necessary to allow the organism to gain access to the body. Wounds made with dirty instruments, especially with earth or dirt from the streets, are those most frequently followed by infection with tetanus. The tissues are generally in a state of depressed vitality from sepsis or other cause; in fact, pyogenic organisms are almost invariably present.

Tetanus is naturally more common among those whose occupation renders them liable to wounds of this character, such as agricultural labourers, stablemen, &c. The organisms are found only in the local

lesion; they do not enter the blood-stream, but act entirely by means of their toxins. These toxins have a specific action upon the motor cells in the spinal cord, medulla and pons, and to a less extent upon those in the cerebral cortex. Tetanus toxin is peculiar in that it passes not by the blood-stream nor the lymphatics, but along the nerves. Marie and Morax have shewn that the toxins are absorbed by the nerve end plates in the muscles, and carried along the *motor* nerve filaments. They do not appear ever to pass along a purely sensory nerve.

Clinical signs.—The incubation period varies within wide limits. In this country it is usually from two to three weeks. Abroad, it is often much shorter, sometimes only a few hours. The severity of the attack is roughly proportional to the shortness of the incubation.

The disease commences with slight fever and difficulty in opening the mouth. This is followed by pain and stiffness in the muscles, commencing with the masseter, internal pterygoid, and small facial muscles, the sternomastoid and trapezius being involved slightly later. As the disease progresses muscular spasms occur, spreading downwards to the trunk and limbs. The hands are seldom affected, and involvement of the respiratory muscles is usually quite a late phenomenon. Great pain is experienced during the spasms, which are typically of a tonic (continuous) character; clonic spasms may also occur as well in the later stages. There is never complete relaxation between the spasms, and the intervals of partial relaxation become gradually shorter. Any stimulus, such as a cold draught of air or a sudden noise, tends to start a spasm.

The contraction of certain groups of muscles may cause the patient to assume characteristic attitudes. The body may be bent backwards (*opisthotonos*) or forwards (*emprosthotonos*), or, more rarely, sideways (*pleurosthotonos*). The angles of the mouth are often retracted, giving rise to a sort of grinning expression (*risus sardonicus*).

The mind, as a rule, is clear to the end, and the sufferings of the patient are very great. The temperature, which during the course of the malady is little

if at all above normal, may rise to extreme heights (*e.g.*, 108° F.) just before death. Death is usually due to exhaustion; sometimes to involvement of the respiratory muscles.

A more chronic form of tetanus sometimes occurs, in which the spasms are less severe and often limited to certain muscles, especially those of mastication. The incubation period is usually three weeks or more in these cases. Recovery is much more frequent than in the acute form, often occurring without treatment.

A special form of tetanus, cephalic tetanus, occasionally follows injuries of the head. It differs from the usual form in that facial palsy is a common accompaniment, and severe maniacal symptoms occur.

In newly-born infants infection may occur through the umbilical cord. It is usually rapidly fatal.

The diagnosis of tetanus is not usually difficult. The conditions which may simulate it are: strychnine poisoning, hydrophobia, tetany, and simple trismus. In *strychnine poisoning* there is complete relaxation between the spasms, and the extremities are chiefly involved. Trismus is rare. The history may clinch the diagnosis.

In *hydrophobia* the mental symptoms are very characteristic, *viz.*, vague fears and hallucinations. The spasms are *clonic* in character; there is marked salivation. The history may be of value. *Tetany* is almost entirely confined to the hands and feet. It occurs most frequently in children. When adults are affected it is usually during the course of acute gastric or intestinal irritation, and is hardly likely to be mistaken for tetanus.

In *simple trismus* due to the irritation, *e.g.*, of a tooth, the muscles of mastication are the *only ones* affected.

Treatment.—Prophylactic treatment is of the first importance; *absolute asepsis*, as far as can be obtained in *all wounds*, whether suspicious or not, is of the greatest value in providing against the infection.

When an attack has occurred treatment must be immediate. Tetanus toxin combines very rapidly with the protoplasm of the cells; and when this combination has taken place, further treatment is of little avail. The local wound must be purified to prevent further

manufacture of toxins by the bacteria. An attempt to neutralize the toxins already present in the blood should be made by injecting a suitable dose of anti-tetanic serum. The results have been by no means so encouraging as those obtained with antidiphtheric serum. This is no doubt due to the rapidity with which combination takes place between the toxin and the cells.

The antitetanic serum is now sometimes injected direct into the spinal canal. The rapidity with which the serum acts is thus increased.

Excretion should be assisted by diuresis and purging. Saline infusion is often of value.

All possible stimuli should be avoided; the room should be darkened, no draughts allowed, and absolute quiet enjoined.

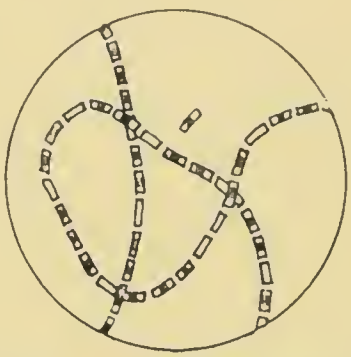


FIG. 9.—Bacillus anthracis
shewing arrangement in chains and spores).

To check the spasms, the best drug is chloroform; large doses of chloral hydrate may be given, say gr. xx combined with potassium bromide 5i every hour; if the patient cannot swallow, this should be given by the rectum. The dose should then be doubled.

ANTHRAX.

Anthrax is a disease affecting sheep and cattle, and is occasionally transmitted from these animals to man. Those who attend to the live animals, or who have to do with carcases or hides and wool, are specially liable. The exciting cause of the disease is the *B. anthracis* (fig. 9). This is a rod-shaped organism, about 8 μ to 10 μ in length; it grows well on ordinary media; and stains with simple stain and by Gram's

method. The organism forms spores which are situated in the centre. These spores, like those of tetanus, are very resistant to antiseptics, and must be boiled for 15 minutes in order to be destroyed with certainty.

Anthrax may occur in man either as a local lesion with subsequent general symptoms, or as a generalized infection without a local lesion.

The local lesion is known as *Malignant pustule*. After an incubation period, which varies from a few hours to two or three weeks, a small red papule appears at the seat of infection, commonly on the hands, arms, face or neck. This is generally preceded by itching and burning sensations. The papule soon becomes a vesicle containing usually blood-stained serum; this ruptures, and a black gangrenous patch forms in the centre, around which a ring of new vesicles forms, surrounded in their turn by a ring of red and inflamed tissue. The black centre progressively enlarges at the expense of the surrounding vesicles; at the same time new vesicles are formed outside it. In some cases the spread is very rapid, in others more gradual.

General symptoms make their appearance, as a rule, as soon as the black patch shows. These are: fever, headache, vomiting, general glandular swelling, and deep-seated pains all over the body. If untreated, coma and death follow.

The treatment is immediate excision of the malignant pustule, taking care to remove all diseased tissue, and to go as deep as possible. The actual cautery may be applied. Some authorities deny that anything is gained by incision of the local lesion, and advise treatment by means of fomentations. Serum treatment is also practised in this disease.

Anthracæmia, or **Woolsorters' Disease**, is a generalized infection with anthrax bacilli, the organisms being either inhaled or swallowed. In the former case the lungs are chiefly involved, with signs of rapid pneumonia; in the latter the gastro-intestinal tract is attacked, giving rise to severe diarrhœa, vomiting, &c. General glandular swelling occurs in both varieties. The disease is extremely fatal.

Treatment.—A fatal issue occurs so rapidly, as a rule, that there is rarely time for treatment. Serum treatment has met with some success.

Gonorrhœa.

Gonorrhœa is an infective inflammation due to the *gonococcus*. It may occur in either sex, and follows coitus. The *Diplococcus gonorrhœæ*, or *gonococcus* (fig. 10), occurs in pairs. Each organism is not perfectly spherical, but the side turned towards its companion coccus is somewhat flattened. It is difficult to grow, blood-agar being the best medium. It stains well with basic aniline dyes, *but not by Gram's method.*

The incubation period of the disease is from two to eight days. In the male it commences with scalding pain on micturition, which has been compared by one imaginative patient to "passing red-hot fish-hooks." There is often some swelling and tenderness of the meatus. The urethral discharge appears about the

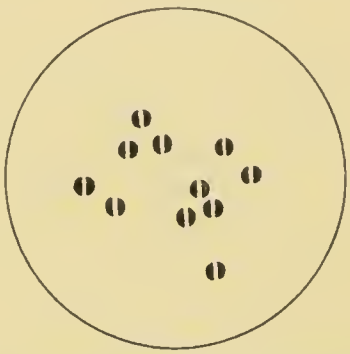


Fig. 10.—Diplococcus Gonorrhœa.

third or fourth day; it is thin and watery at first, but soon becomes thick and purulent.

The local manifestations are generally accompanied by some general symptoms such as slight fever, malaise, general aching pains, especially in the back, constipation, &c.

In the female, in addition to the urethra, the cervix and vagina may be involved.

The *diagnosis* of the disease is usually obvious. In doubtful cases a bacteriological examination will determine the nature of the condition.

The treatment in the early stages should be directed towards rendering the urine less acid to prevent further irritation of the inflamed urethra. For this purpose a mixture containing potassium bicarb. gr. xx. combined with tinct. hyoscyami ɱxxv is

given three times a day. Saline purges should be given for the constipation. Alcohol should be forbidden, and a light diet, including plenty of fluids, such as milk or barley water, advised.

Urethral injections are not, as a rule, required in the early stages. If the discharge continues, however, they will be necessary. The usual injection given is zinc permanganate gr. $\frac{1}{4}$ ad. ℥i of warm water about five or six times a day.

Another formula is tinct. catechu ℥v and zinc sulphate gr.i ad. ℥i of water.

If allowed to progress untreated, the inflammation which commences in the anterior portion of the urethra tends to spread back and involve the posterior urethra. The disease then is far more difficult to deal with, and often goes on to a chronic gleet. Further spread of the disease may involve neighbouring structures, the most important being the prostate, vesiculæ seminales, bladder, or epididymis. Treatment of the chronic condition is very tedious, involving a long course of urethral injections.

Inflammation of joints is a frequent complication of gonorrhœa; the knee-joint is perhaps most frequently affected. An acute painful inflammation of a single joint in a young man, without a history of injury, is almost always gonorrhœal in origin.

Gonorrhœal conjunctivitis is an important and very serious condition, and is dealt with in Chapter XXIX.

Perhaps the most frequent and one of the most tiresome complications of gonorrhœa, especially of chronic cases and where the posterior urethra is affected, is *stricture*. This may show itself a considerable time after the apparent cure of the disease. Space forbids us to deal at any length with the treatment of stricture. Dilatation with bougies of gradually increasing size will usually be successful in maintaining sufficient passage for the urine. In more obstinate cases operative interference and cutting of the stricture may be required.

An antigonococcic serum is now prepared, and in some cases great benefits have followed its use.

Soft Chancre (Ulcus Molle).—This condition is only of importance in view of its resemblance to the true syphilitic or hard chancre. The cause of the condition

is a streptobacillus described by and named after Ducrey.

Ducrey's bacillus (fig. 11) is a slender, rod-shaped organism; it is very short, the average length being about 1.5 μ; it tends to form chains. No spores are formed by this organism. It stains moderately well with simple stains, *but not by Gram's method* It is difficult to grow; blood-agar is the best medium.

The incubation period is from one to five days. It occurs almost invariably after coitus, and either sex may be affected; extragenital soft chancres are extremely rare.

A red papule first appears, which becomes a vesicle

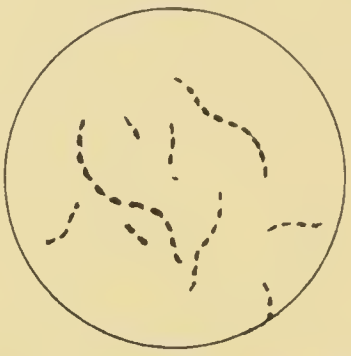


FIG. 11.—Ducrey's Bacillus.

about the third day, and a pustule soon after. This bursts, leaving an extremely painful ulcer with clean-cut edges, and normally no induration of its base; there is considerable purulent discharge. The ulcers are frequently multiple, infection occurring from one to the other in the same individual. This is never the case in syphilis. If the ulcer becomes infected, the base may show some induration.

There is usually some glandular swelling in the groins, sometimes followed by suppuration.

In making the diagnosis from syphilis, the following table may be of value:—

	Hard Chancre.	*Soft Chancre.*
Incubation period.	Long, average three weeks, single.	Short, one to five days, often multiple.
	Much induration of base, usually painless.	No induration as a rule, painful.
	Secondary symptoms occur.	No secondary symptoms.
	Spirochæte found in scraping.	Ducrey's B. found in scraping.

Treatment.—The soft chancre usually heals in three weeks under ordinary antiseptic treatment. The ulcer should be washed with hydrogen peroxide solution, dusted with iodoform, and kept protected from irritation. Glands in the groin should be fomented. If they suppurate they should be opened and scraped, plugged with iodoform gauze and dressed. The incision should be vertical to give free exit for the pus.

Syphilis.

This and the two following conditions—*viz.*, Tuberculosis and Actinomycosis—are known as *Infective granulomata*. This term implies that the three diseases, all due to infection by specific organisms, are characterized by the formation of inflammatory

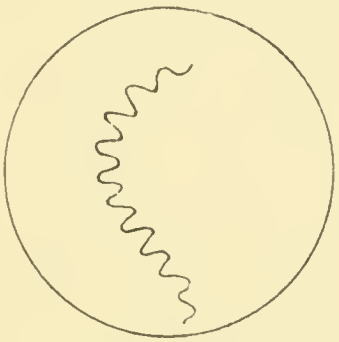


Fig. 12.—Spirochæte pallida.

granulation tissue, due to the chronic irritation which occurs in all three conditions.

Syphilis may be congenital or acquired. In both cases it is the direct result of infection by the *Spirochæta pallida*. This organism is considered by most authorities to be not a bacterium, but a protozoon. It is spiral in shape, with about six to eight curves; its length is about 7 μ. It possesses a flagellum at each pole, and is motile. Up till quite recently it had never been obtained in pure culture outside the body. Recent experiments with special media appear to have been successful. In order to demonstrate the organism, it should be stained by Giemsa's method. This stains the spirochæte red.

Numerous other spirochætes have been described which resemble the organism of syphilis in varying

degrees. Special methods are required to distinguish them.

Acquired Syphilis usually follows coitus, the site of inoculation then being the external genitals. Extragenital inoculation sometimes occurs, *e.g.*, on the lip from an infected spoon or fork, or from kissing, &c.

Three stages are described, *viz.*, Primary, secondary, and tertiary.

The Primary stage begins after an incubation period of from ten days to six weeks (usually three weeks) in a small, hard, purplish nodule. Occasionally, if the nodule be not irritated, it may escape ulceration. More commonly ulceration takes place, forming the *Hunterian* or *hard chancre*. This is a circular, flattened, unhealthy-looking ulcer with an extremely hard, indurated base; the discharge is thin and watery; the ulcer is usually painless.

Extragenital chancres are very similar, but there is often considerable discharge, and the induration of the base may be less distinct. Cases are met with, especially in extragenital lesions, when the primary lesion is so slight that it escapes notice altogether.

The glands in the groin become enlarged and hard. They are freely movable and painless, and rarely suppurate unless sepsis occurs at the site of the chancre, when suppuration may occur. They are known as *bullet buboes*.

Hard chancres are almost invariably single. Cases in which two lesions have occurred have been described. Infection in these cases attacked the two places at the same time; one lesion is not inoculated from the other.

The Secondary stage is the manifestation of the syphilitic virus in the general circulation; it usually begins about six weeks after the appearance of the primary sore; it may last any time from a few months to two or three years if untreated. The symptoms vary much in severity. The onset is often accompanied by slight fever, headache and malaise.

Skin eruptions of various kinds occur in this stage. The earliest to appear is usually a macular rash, rather resembling that of measles. This soon fades, but leaves behind it a coppery stain; sometimes it desquamates. *Papular*, *vesicular*, *pustular*, and *bullous*

eruptions may occur, two or more different types commonly being present at the same time. The bullous eruption is known as *Pemphigus*. The pustular rash often dries up leaving scabs, which, when they disappear, do not show ulceration beneath. This condition is called *Ecthyma*. *Rupia* is a condition in which ulceration occurs beneath a scab, causing the formation of progressively larger scabs, one beneath the other. Any of these eruptions may leave a coppery stain on the skin.

Condylomata occur in positions where the skin is moist, especially where two skin surfaces are in contact, *e.g.*, anus, vulva, scrotum, &c. They are slightly raised, well-defined papules, with flat surfaces covered with sodden epidermis, giving them a whitish appearance. They are extremely contagious.

Mucous patches (mucous tubercles) are similar, slightly raised, flat, whitish patches, occurring on mucous membranes, notably on the cheeks, palate, and fauces.

Numerous other organs are affected during the secondary stage.

The hair becomes dry and tends to fall out. Ulceration under the *nails*, with swelling of the finger-tip, may occur (*syphilitic onychia*).

Inflammation of the *tongue*, *lips*, *tonsils*, and *larynx* is very frequent; it may progress to ulceration. It is to this laryngeal inflammation that the *hoarseness*, a frequent secondary symptom, is due.

Lymphatic glands are often enlarged and slightly tender, especially those in the posterior triangle of the neck, and above the internal condyle of the humerus.

Painless effusion of fluid into *joints* sometimes occurs, the knee-joint being most commonly affected.

Bones (*see* Chapter XVII).

Eye (*see* Chapter XXIX).

Orchitis occurs as an occasional late complication. The testis itself is affected, the epididymis and spermatic cord commonly escaping. The testis is enlarged, smooth, *heavy*, firm, and painless. Testicular sensation may be lost. *Hydrocele* also may be present.

The Tertiary stage is very variable in its time of onset. It may occur within a few months of the primary lesion, or it may be delayed for many years.

It is often overlapped by the later secondary manifestations.

The typical tertiary syphilitic lesion is known as a *Gumma*. This term is used somewhat differently by different writers. Some apply it to any tertiary syphilitic swelling or ulceration, others confine its use to well-defined circular swellings, the other tertiary manifestations being called *Gummatous*.

A gumma may involve any organ in the body. It is accompanied by obliterative endarteritis, which, by cutting off the blood supply, results in degenerative changes in the gumma.

On microscopical examination three zones are seen. In the centre is a mass of degenerated caseous and fatty material. Around this is a ring of fibrous tissue, surrounded in its turn by an area of round-celled infiltration.

Giant cells are frequently present. They are smaller and not so numerous as in tubercle (*q.v.*) The protoplasm is granular; there are few nuclei (two or three), which have no definite arrangement in the cell.

If a gumma involves the surface, ulceration occurs. Gummatous ulceration presents itself in various positions, notably the skin, tongue, epiglottis, larynx, &c. It is very destructive in character. The alimentary system may be affected at either end, *viz.*, the mouth or rectum, but rarely in other parts.

The tertiary manifestations in various organs, such as bones and joints, arteries, testis, liver, spleen, eyes, &c., will be dealt with when the diseases of these organs are discussed. Certain very late manifestations of syphilis, in which the central nervous system is affected, are called *parasyphilitic* affections. *Tabes dorsalis* and *general paralysis* are the best-known examples. A text-book on medicine must be consulted for information with regard to these conditions.

Treatment.—The treatment of syphilis is local and general, the latter being by far the most important.

Local Treatment.—*The primary sore* should be washed with hydrogen peroxide solution, or *Lotio hydrargyri nigra* (blackwash), and then dusted with iodoform or dressed with calomel ointment—irritation must be avoided as far as possible.

Secondary lesions are best treated with ammoniated

mercury ointment (half the strength of the B.P. preparation).

Condylomata may be dusted with a powder consisting of equal parts of calomel and zinc oxide.

For the *throat*, a gargle composed of liq. sodæ chlorinatæ ʒss ad. ʒi is useful.

Gummata should rarely be incised. When ulcerated, they should be treated on general lines (*vide* Ulceration). The half-strength ammoniated mercury ointment may be used.

General Treatment.—In the primary and secondary stages attention must be paid to the general health. Fresh air and regular habits are important; alcohol should be forbidden; tobacco is often very irritating to the throat, and should not be freely indulged in. The bowels should be kept acting regularly, and if anæmia is present, iron should be given.

Mercury has a specific action upon the first two stages of the malady; it may be administered in various ways.

(1) *By the Mouth.*—Hydrarg. c. cret. gr. i three times a day, the dose being gradually increased, or liq. hydrarg. perchlor. ʒi three times a day.

(2) *By Inunction.*—Mercury ointment is used. ʒss to ʒi should be rubbed in every night, the area used being carefully washed the next morning to avoid irritation. A different place should be chosen each day, the groins and axillæ being most suitable.

(3) *By an Intra-muscular Injection.*—This method causes considerable pain and irritation, and does not appear to possess any great advantages. Various salts are used, the perchloride being perhaps the most usual. Metallic mercury is also used.

The mercurial treatment of syphilis must be continued for at least two years, though it need not be so freely administered during the later stage of the period. The effects of the drug vary considerably in different patients, some reacting quickly to very small doses. A careful watch must be kept upon the condition of the mouth and gums. Mouth-washes, such as chlorate of potash gr. xv ad. ʒi should be frequently used; and at the first signs of soreness of the gums, or salivation (*see* Mercurial Stomatitis, p. 168), the dose should be reduced until the symptoms dis-

appear. It may even be necessary to discontinue the drug altogether for a time.

Iodides do not appear to have any beneficial effect upon the primary or earlier secondary stages. They are sometimes of value in the later stages of the secondary period. Upon the tertiary lesions, iodides have a specific action. They should be administered in doses of 10 gr. three times a day, at the commencement; the dose may be increased later. If the patient has not undergone a two-years' course of mercurial treatment in the earlier stages, it may be useful to give mercury in combination with the iodide. A useful prescription is:—

℞	Pot. iod.	gr.x
	Liq. hydrarg. perchlor.	℥i
	Tinct. zingib.	℥i
	Decoct. sarsæ co. ad.	℥i

℥i. three times a day.

It is necessary when administering iodides to be on the look-out for any signs of toxic symptoms due to the drug. *Iodism*, as it is called, may shew itself in very varying forms. Most commonly, symptoms of catarrh appear, affecting the nasal and buccal mucous membranes; running from the nose, cough with much phlegm, frontal headache (from implication of the frontal sinuses), &c., being present.

This may be treated either by stopping the drug temporarily, or by halving the dose; if the dose be *doubled*, the symptoms often disappear.

Recent extensive researches by Ehrlich have shown that an organic arsenic compound, dioxydiamino-arsenobenzol, or "606" as it is called, has a remarkable effect upon all the stages of syphilis, even including the parasyphilitic affections. It is too early yet to be sure of the ultimate results of the treatment. It is given by injection either subcutaneously or intravenously. Opinions still differ as to the correct dose; subcutaneously about 5 gr. is commonly given. No untoward effects seem to follow the use of the drug.

Congenital Syphilis may be inherited either from father or mother. In the former case, infection probably occurs from the spermatozoon at the moment of fertilization; in the latter case, through the placental

circulation. It may affect the fœtus *in utero*, and is a common cause of miscarriage.

In other cases, the child may appear healthy at birth, the symptoms developing a few weeks to three months later.

The principal clinical signs are: *Catarrh* of the nasal and buccal mucous membrane, causing *snuffles*; this interferes with the development of the nasal bones, resulting in the depressed bridge of the nose, so characteristic of the condition; general *wasting*; various types of *skin eruptions*, especially affecting the buttocks; *condylomata*, *mucous patches*, *ulcerations* in various parts; scars at the corners of the mouth are often left as a memento of the disease.

Gastro-intestinal symptoms, such as diarrhœa and vomiting, are common; there is often great swelling of the abdomen. Similar affections of the *hair*, *nails*, *bones*, &c., occur as in the acquired variety. Effusions into *joints*, especially the knee-joint, are more common in the congenital than the acquired form; the effusions are often bilateral. Later on, tertiary manifestations, gummata, and gummatous ulcerations of palate, &c., may appear. The skull is often affected.

Interstitial Keratitis, *see* Chapter XXIX.

The teeth are frequently affected in congenital syphilis, a deformity of the tooth occurring in some cases, as well as imperfect calcification. The upper centrals are the most often affected, but all the incisors, the canines and first molars in the upper and lower jaws may also be deformed. In the incisors the central denticle is deficient and the side ones curve inwards, leaving a notch between them, so that the tooth is barrel-shaped, and notched; the canines also shew a notch at the apex, and the molars have very low, rounded cusps. The enamel and dentine of such teeth are imperfectly calcified. Typical syphilitic or *Hutchinsonian* teeth may very rarely be caused by some other lesion than syphilis. A detailed description of the condition will be found in Colyer's "Dental Surgery."

Tuberculosis.

Tuberculosis is an infective granuloma, due to the *Bacillus tuberculosis*, a non-motile, slender rod from

3 to 5 μ in length. It sometimes appears to branch, suggesting a relationship to the streptothrices (*vide* Actinomycosis, p. 100). It stains slowly with simple stains, and often irregularly, giving it a beaded appearance, and suggesting the presence of spores. In all probability, however, the organism does not form spores. It stains by Gram's method. When stained with hot carbol fuchsin, the stain is not removed by dilute sulphuric acid, nor by alcohol. The organism is therefore said to be *acid-fast* and *alcohol-fast*. This serves as a method of differentiating it from organisms otherwise resembling it. There are a large number of acid-fast organisms, of which the most important are the leprosy bacillus and the smegma bacillus. (The latter, though *acid-fast*, is not *alcohol-fast*.) The *B. lepræ* may be distinguished



FIG. 13.—Bacillus tuberculosis.

from the tubercle bacillus by the fact that, though it will retain its stain under weak acid (*e.g.*, 5 per cent. H_2SO_4), stronger acid will decolorize it, while the tubercle bacillus remains stained.

The tubercle bacillus can be grown upon glycerine agar, but the growth is slow.

The typical lesion produced by the organism consists of a number of similar areas known as *miliary tubercles* or *grey granulations*. In the early stages these are about the size of a pin's head, and gradually increase as the disease progresses, undergoing degenerative changes in the centre.

A miliary tubercle is made up of a number of *giant cell systems*. On microscopical examination, each giant cell system is found to be composed of three zones of cells. In the centre are one or more large,

branching hyaline giant cells containing many nuclei; the nuclei are most commonly arranged regularly around the periphery of the cell. Tubercle bacilli may sometimes be seen inside the giant cells. Around the giant cell is a zone of smaller mononuclear cells; these are known as *epithelioid* cells, though they are really endothelial in origin. The branches of the giant cell pass in between these cells.

Outside these again is a zone of small round cells, mostly lymphocytes. Giant cells may occur in any very chronic irritation, such as syphilis, actinomycosis, leprosy, &c. (*q.v.*).

Owing to the fact that the blood supply is interfered with, there is great tendency to fatty degeneration and caseation; this commences in the centre of the growth, a mass of caseous material being formed. In some cases this caseous material undergoes liquefaction, a a mass of caseous material being formed. In some solidification and, more rarely, calcification occur. Owing to the chronic irritation there is always some fibrous tissue formation; this is greater in amount in very old-standing cases. Infection may occur through the respiratory or alimentary tracts, and more rarely through the skin.

Anything which depresses the general health, such as overcrowding, with its attendant evils, want of fresh air, dirty surroundings, &c., will act as a predisposing cause.

Various organs may be affected. Infection may reach the lungs or gut directly, or the skin (lupus), or it may spread through the lymphatics to the lymphatic glands; or, again, *viâ* the blood-stream to other organs, such as the bones, kidney, testis, &c.; or become a generalized infection. Secondary infection may occur, *e.g.*, from the lungs to the larynx.

The *clinical signs* depend upon the particular position of the lesion. The manifestations of the disease in those organs which it is necessary for us to discuss will be found in the chapters dealing with those organs.

General symptoms include progressive wasting, night sweats, irregular fever, &c. In the later stages, amyloid disease may occur.

General treatment involves fresh air, good food, and such drugs as cod-liver oil, phosphate of iron, &c.

For local treatment, *see* appropriate chapters.

Actinomycosis.

Actinomycosis is an infective granuloma due to a number of allied organisms belonging to the *Streptothrix* group, often classed together under the name *Actinomyces or Ray Fungus*.

To the naked eye they appear as little round masses, seldom larger than a pin's head, of a colour varying from grey to greenish yellow. They are usually soft, but occasionally contain calcareous deposit. Microscopically, each of these colonies is seen to be composed of a tangled mass of branching filaments, arranged radially at the periphery. The terminations of these radially arranged filaments are often swollen into pear-shaped bodies or *clubs*. *Spores* are also formed in certain segments of the filaments.



Fig. 14.—Actinomyces.

The filaments stain by Gram's method; the clubs do not. The organism grows slowly in ordinary media. Very slow-growing tumours, composed chiefly of granulation tissue, which later on undergoes central degeneration and suppuration, are characteristic of the disease. Giant cells are often present. They are smaller than those of tubercle, and their protoplasm is granular. They contain a few large nuclei, which do not shew any typical arrangement.

The disease is common in cattle, the organisms being in all probability present on barley and other corn. In cattle it has received various names, *viz.*, wooden tongue, cancer, osteosarcoma, &c.

In man it is found in various situations, chiefly about the mouth and face, infection probably occurring through a diseased tooth or small abrasion. When

inhaled, the lungs may be affected, or the organism, when swallowed, may attack the intestine.

More rarely the organisms reach the blood, bringing about a condition resembling chronic pyæmia, actinomycotic abscesses being formed all over the body.

A common starting point for the disease is in the lower jaw. A hard fibrous tumour slowly forms, expanding the bone, and gradually spreading to the skin of the cheek, and down into the neck. Free suppuration occurs with the formation of numerous sinuses. When the superior maxilla is attacked, the disease may spread to the base of the skull, and thence to the brain. In other positions, similar phenomena occur. When the gut is involved, the cæcum is most frequently attacked; this condition may simulate a very chronic appendicitis.

Diagnosis.—The disease is readily mistaken for tubercle, syphilis, or malignant disease. The absence of glandular involvement may be suggestive, but microscopical examination of the pus is the only certain means of differentiation.

Treatment.—When no vital organs are involved, early free excision of the diseased area should be practised. If this is impossible, free incisions, and antiseptic treatment must be resorted to.

Large doses of potassium iodide (*e.g.*, 30 gr.) often have greatly beneficial effects.

CHAPTER XIII.

GENERAL CONSTITUTIONAL DISEASES.

Rickets.

Rachitis, or rickets, is a general disease dependent upon malnutrition, and chiefly affecting the bones. It occurs in children, usually during the first two years of life. The chief factors in its causation are insufficient or improper feeding, especially any substitute for maternal milk.

Under certain circumstances, the mother is incapable of giving the required nourishment. In these cases we must rely upon artificial substitutes.

The chief pathological changes occur in the bones. Opinions differ as to the exact interpretation of the changes that take place. Some hold that there is no increased absorption of bone from within, and that the matrix laid down is normal, the whole fault lying in *imperfect calcification* of this normal matrix. Others, though agreeing that calcification is imperfect, are of opinion that increased absorption from within does take place.

Whatever the exact pathology of the condition may be, it results in great softening of the bones, and enlargement at the junction of the epiphysis and diaphysis of the long bones. The long bones incline to bend, especially the tibiæ and femora, genu valgum (knock-knee) or genu varum (bow legs) resulting. The chest assumes a characteristic *pigeon-breast* shape; the upper ribs fall in, but the lower ribs are kept in place by the pressure of the abdominal organs; the sternum is thus pushed forward. Spinal curvature also occurs. At the junctions of the ribs with their cartilages, hard nodular swellings are formed. These are known as the *rickety rosary*. There is a great tendency to greenstick fracture. *Craniotabes* is a condition characterized by considerable thinning of the bones of the vault of the skull. The bones may

become as thin as paper in some places. This condition may occur in rickets, and also in congenital syphilis.

The child is restless, and cries a good deal, owing to tenderness of the bones; night sweats are frequent. The abdomen is much enlarged, and alternate attacks of diarrhœa and constipation often occur.

Tetany and convulsions may follow, and laryngismus stridulus may complicate the condition. Thrush is a frequent complication of rickets. Rickets may occur in company with tubercle or congenital syphilis, but there is no satisfactory evidence of any connection between these conditions.

Treatment is long and tedious. Fresh air, good food with plenty of fresh milk, are important. Cod-liver oil and syrupus ferri phosphatis may be given. The bowels must be kept regulated. Hydrarg. c. cret. gr. $\frac{1}{2}$ to 1 is useful. The child must not be allowed to walk; to prevent this splints may be applied to the legs if necessary.

Scurvy.

Scurvy is a disease which depends upon the omission of fresh vegetables and fruit from the diet. It is uncommon nowadays, but at one time was very rife in prisons and on board ship, where men lived in confined quarters upon artificially preserved foods.

The principal *clinical signs* of the malady are: Great weakness and prostration, breathlessness on exertion, joint pains, and a tendency to spontaneous hæmorrhages. The gums are spongy, and readily bleed. Hæmorrhages commonly occur into the muscles, causing painful swellings. Purpuric eruptions may be present, and there is generally some anæmia.

If untreated, fever and inflammatory complications, such as pleurisy, occur. There may be fatal internal hæmorrhages, *e.g.*, into serous cavities, or solid organs, such as the brain.

Treatment is simple, and consists in supplying a sufficiency of *fresh* vegetables and fruit. Lime juice is useful. Iron should be given for the anæmia.

Infantile Scurvy (Barlow's disease) is a similar

condition affecting infants. Hæmorrhages under the periosteum of the long bones are common, and this condition may be easily mistaken for acute periostitis.

Hæmophilia.

Hæmophilia is an hereditary disease, characterized by great tendency to uncontrollable hæmorrhage. This is due to an absence or diminution in the quantity of fibrin ferment present in the blood, and a consequent lessening of the power of clotting.

The disease is transmitted by the females of the affected family, and not by the males; it is the males, however, that most frequently suffer from the malady. A female member of the family may transmit the disease to her children, even though she herself shews no symptoms.

It is a very dangerous condition, quite trivial operations, such as the extraction of a tooth, resulting often in fatal bleeding.

Great internal hæmorrhages may occur into muscles, joints, bursæ, &c. The patellar bursa is frequently affected in this way owing to its liability to injury. The coagulation period of the blood is commonly much increased; it may be as much as sixty minutes instead of the normal three or four. A considerable leucopenia (diminution in the number of leucocytes in the blood) is often present, and also some diminution in the number of red corpuscles.

The prognosis is always grave. The patient must exercise extreme care in avoiding slight injuries; no hard manual labour or violent exertion should be allowed. Female members of an affected family, though apparently healthy themselves, *should not marry*.

No operations should be performed, except in cases of extreme emergency. When external bleeding occurs, it must be treated on general lines (*see* Chapter VI), by means of styptics, &c. Calcium chloride may be useful as a local application. The value of calcium given internally has been much discussed. The fact that the hæmophilic blood contains a normal quantity of calcium suggests that no advantage would be gained by administering more. But experiments have

shewn that a course of calcium definitely reduces the coagulation period in certain cases. One of the authors has succeeded in reducing his own coagulation period from six to under four minutes after the use of calcium lactate 10 gr. three times a day for five days. Clinically, the administration of calcium for this period preparatory to necessary operation seems to have a beneficial effect in the slighter cases of hæmophilia (or supposed hæmophilia).

It has been pointed out that the reason why the blood of a hæmophilic fails to clot is that it contains insufficient fibrin ferment. If this substance can be supplied, the blood should clot. Fibrin ferment is easily obtained (it is contained in normal horse serum), and is most useful in these cases.

Status Lymphaticus.

Status lymphaticus, or status thymicus, is a condition about which very little is known. It is possibly a congenital affection, and may accompany such diseases as rickets. The thymus gland is persistent and enlarged; there is a general enlargement of all lymphatic glands, and an increase of lymphoid tissue generally. Enlarged tonsils and adenoid growths are frequently present.

In cases of sudden death under general anæsthetics, of apparently healthy children, this condition has frequently been discovered in the *post-mortem room*. It is often impossible to recognize the condition *ante mortem*.

Treatment.—If the disease is suspected, general hygienic treatment, fresh air, &c., is required. The tonsils and adenoids should be removed, without a *general* anæsthetic.

CHAPTER XIV.

NEW GROWTHS—SOLID.

New growths or neoplasms may be solid or cystic. In this chapter, the most important points in regard to solid neoplasms will be considered. The word *tumour* is used in different senses, and this fact if not realized may be very misleading to students. Sometimes the word is used to mean any abnormal swelling, not necessarily a new growth; as, for example, an abscess or an inflammatory swelling in a gland. Again, it may be used to denote a solid swelling in contra-distinction to a cystic swelling; that is to say, one may speak of "tumours and cysts" as two different classes of neoplasm. In other cases the term tumour may be used strictly to mean a neoplasm, whether solid or with fluid contents. A neoplasm is a growth of new tissue, which is always, to a certain extent, atypical, performs no physiological function, and does not tend to disappear of its own accord. It would be undesirable in a manual of the present scope to attempt to exhaust this subject, the limits of which are very wide; but it is necessary to draw attention to certain fundamental points.

Many classifications of tumours have been suggested, and these vary a good deal, especially in regard to the group of tumours known as Endotheliomata. Many pathologists now include in this class several varieties of neoplasm which hitherto have found their place in one of the other groups. A notable example is the Melanotic Sarcoma, which some authorities now regard as an Endothelioma. For the purpose of the examination for which this book is mainly intended, it will be sufficient if the student grasps and understands *one* of the many classifications to be found in recent text-books. The classification adopted in the following pages is taken from Rose and Carless's "Surgery."

Solid tumours are first divided into two great classes,

viz., *Simple* and *Malignant*. It is essential that the reader should fully realise the differences between these two classes. In the following table the main points are set forth:—

Simple Tumour.	*Malignant Tumour.*
(1) Grows slowly.	(1) Grows rapidly in most cases.
(2) Often ceases to grow after a time.	(2) Though growth in some cases may appear to cease for a time, it always begins again.
(3) Has definite limits.	(3) Has no definite limits.
(4) Usually very like normal adult tissue on microscopic examination.	(4) Tissue embryonic and markedly atypical.
(5) Never infiltrates surrounding tissues.	(5) Tends to infiltrate surrounding tissues.
(6) If *completely* removed does not recur.	(6) Has great tendency to recur locally.
(7) Does not form secondary growths in other parts of the body.	(7) Tends to form secondary growths.
(8) Has no effect upon the health, except from its size and weight, or from such an accident as hæmorrhage, pressure upon surrounding structures, or interference with the function of the organ in which it is situated.	(8) Has definite effect upon health, known as cachexia.

At present the etiology consists mainly of theory. There is, however, considerable evidence suggesting that chronic irritation is an important etiological factor, especially in regard to carcinomata.

Solid tumours are again divided according to tissues from which they arise into four classes, of which the first two are the most important:—

(I) Connective Tissue Tumours
- (1) *Simple*, variously named, according to the tissue composing them.
- (2) *Malignant*. Sarcoma.

(II) Tumours Chiefly Epithelial
- (1) *Simple* — Papilloma. Adenoma.
- (2) *Malignant*. Carcinoma.

(III) Endothelial Tumours.—Endothelioma.

(IV) Tumours due to the inclusion of part of another embryo.—Teratomata.

(I) 1.—Simple Connective Tissue Tumours.

A Myxoma is a tumour composed of myxomatous or mucoid tissue, similar to that found in the umbilical cord (Wharton's jelly). Pure myxomata, as a rule, involve mucous surfaces, and are rare. A nasal polype, often spoken of as a myxoma, contains fibrous tissue also, and is therefore strictly a fibromyxoma. Myxomata are semi-translucent, rounded tumours which grow slowly and rarely attain any great size.

The treatment is to remove the growth.

A Fibroma is a tumour composed of fibrous tissue. Two clinical varieties occur, *hard* and *soft*, the hard fibromata containing comparatively fewer cells and more fibres than the soft.

Hard fibromata occur around the jaws and teeth as fibrous epulis (*q.v.*), and also growing from the basilar portion of the occipital bone downwards into the nasopharynx (fibrous polypus of the nasopharynx).

These tumours are very hard; on section the surface is whitish brown and glistening. Sometimes they undergo sarcomatous change. They should be removed.

Soft fibromata occur most commonly under the skin; they do not, as a rule, attain any great size, and are often multiple. If they cause symptoms, or show any tendency to rapid growth, they should be removed.

Soft fibromata, in which a number of nerve fibres ramify, arise from the sheaths of cutaneous nerves. These are known as *neurofibromata*, or *false neuromata;* these tumours are generally multiple and often extremely painful. When pigmentation of the skin is associated with the development of multiple neurofibromata, the condition is known as *Recklinghausen's disease*. These tumours, if causing discomfort, should be removed.

The so-called fibroids, which are so common in the uterus, are mixed tumours containing muscular as well as fibrous tissue, and are therefore called *Fibromyomata*.

A Lipoma is a tumour consisting of ordinary cellular tissue, infiltrated with fat, and separated into partitions by fibrous septa. These tumours are most common in the subcutaneous tissue, and are frequently multiple. They are soft, and often appear to fluctuate, and so are

liable to be mistaken for a chronic abscess. A lipoma, however, has a typical lobulated feel, difficult to describe, but easy to recognize when once felt; also, the fibrous septa are attached to the skin, so that the skin dimples over the tumour when it is moved. Lipomata may attain considerable size, and are prone to undergo degeneration, especially of the calcareous type. They rarely become malignant. When a large area of tissue undergoes fatty infiltration, as is not uncommon in middle-aged men who drink a good deal of beer, the condition is known as a *Diffuse lipoma*, or *Lipomatosis*. The cellular tissue of the neck is a common situation.

The treatment of the ordinary non-diffuse form is removal, especially if causing pain. In the diffuse form this may be very difficult; in such a case an attempt may be made to deal with the condition by removing the predisposing causes, *i.e.*, cutting down the allowance of beer, and advising plenty of exercise in the fresh air.

Myoma.—Pure myomata, that is, tumours composed of the muscular tissue alone, are rare. As mentioned above, fibromyomata are of common occurrence in the uterus; they also affect the prostate and the ovary. They have a great tendency to undergo degenerative changes, either calcareous, mucoid or sarcomatous. They may also become infected with septic micro-organisms.

The treatment of uterine or ovarian fibroids lies within the province of the gynæcologist, and the prostatic form, if causing symptoms, requires operative measures.

Neuroma.—Pure neuromata are very rare, and need not be discussed. (For false neuromata see above, under Fibroma.)

Chondroma and Osteoma.—These tumours are dealt with in Chapter XVII.

Glioma.—This term is applied to two different types of tumour. A true glioma is a tumour arising from the neuroglia of the brain or spinal cord. It is quite benign, though its growth may be rapid. It often causes serious symptoms owing to its position. The clinical diagnosis of a glioma from a sarcoma is extremely difficult, and can rarely be made with certainty until after removal. It may be distinguished from a

gumma by the history (though of course a patient who has had syphilis may have a glioma) and by the fact that antisyphilitic remedies have no effect upon it. The treatment therefore is always removal where the situation of the growth allows of operative interference.

The so-called "glioma of the retina" is not really a glioma, but a small, round-celled sarcoma (*q.v.*).

An Angeioma is a tumour which consists chiefly of blood-vessels.

(1) *A simple or capillary nævus* may occur in the skin, sometimes involving the subcutaneous tissues also. It consists of dilated capillaries. It is not, as a rule, large in size; its colour is reddish, hence the term "port wine stain." It is usually present at birth (sometimes called *birth-* or *mother's mark*), and it never appears long after birth.

Treatment.—Small capillary angeiomata do not require treatment unless for cosmetic purposes. They may be destroyed by various methods of cauterization, *e.g.*, electric cautery, carbon dioxide snow, actual cautery, or by electrolysis, *i.e.*, the passage of an electric current through the tumour. If these methods fail, excision may be required.

(2) *A cavernous angeioma* (venous nævus) may involve the skin and subcutaneous tissues, and occasionally the viscera, especially the liver. It consists of much larger spaces full of blood, and separated by septa. Clinically, it forms a soft, easily compressible, lobulated tumour of a dusky red colour, which does not pulsate. The blood may be driven out by pressure, but returns as soon as the pressure is removed. These tumours should be excised if possible, or else treated by electrolysis.

Lymphangeiomata and Lymphadenoma. — *See* Chapter X.

Odontomata.—*See* Diseases of the Jaws.

2.—Malignant Connective Tissue Tumours.

A Sarcoma consists of cells, which may be round or spindle-shaped, and a fibrous stroma which *envelops each individual cell*, and separates it from its neighbours (*cf. Carcinoma*). At first the tumour may be encapsuled, but the growth is never limited for any length of time, infiltration of surrounding tissues soon occurring. Sarcomata are very vascular, occasionally so much so

that they pulsate. Dissemination occurs typically by means of the blood-stream, small portions of the tumour getting loose in a vessel and passing round to some other part of the body, where they find a resting-place and commence to form a secondary growth. These small fragments are called *Malignant emboli.* Dissemination *viâ* the lymphatics sometimes occurs, in such varieties as lymphosarcoma and melanotic sarcoma. Degenerative changes, either mucoid, fatty or calcareous, are common. These tumours may be congenital or may arise in the first few years of life. Apart from this, they are rare until after the age of forty. The following varieties are recognized:—

Round-celled Sarcoma.—Composed of round cells, which may be large or small. The small, round-celled sarcoma is usually the most malignant of the two. Lymphosarcomata (*vide* Chapter X), if not identical, are closely akin to this variety.

Spindle-celled Sarcoma, in which the cells are spindle or oat-shaped. Again, they may be small or large; both varieties are very malignant. Clinically, the shape of the cells cannot be diagnosed, especially as many tumours (so-called *mixed-cell sarcoma)* contain cells of both shapes; nor would it be of any practical value if it were possible to make such a diagnosis.

Alveolar Sarcoma.—The cells in this variety lie in masses. The stroma does not pass between each individual cell. For this, and many other reasons, many pathologists deny that these tumours are sarcomatous, some placing them among the carcinomata, others among the endotheliomata.

Melanotic Sarcoma.—A very malignant type of tumour which affects the skin, and the choroid coat of the eye. It frequently commences in a pigmented mole or wart. The striking feature of this variety is the presence in the tumour of a black pigment known as *melanin.* In the later stages of the disease this pigment may appear in the urine, giving rise to the condition known as *Melanuria.* Microscopically, the structure of the tumour is very similar to an alveolar sarcoma. There is much difference of opinion as to whether this type also should not be classed among endothelial or carcinomatous tumours.

Myeloid Sarcoma.—*See* Chapter XVII.

Treatment.—A sarcoma, if diagnosed early, before the formation of secondary growths or the involvement of vital organs, should always be removed, as this offers the only reasonable hope of recovery. In cases where operation is impossible, other methods, such as X-rays, radium, or Coley's fluid* may be of transitory benefit.

(II) 1.—Simple Epithelial Tumours.

A Papilloma is a tumour composed of a core of mesoblastic tissue covered by a layer of epithelium. These growths are classified according to the type of epithelium which covers them, *i.e.*, squamous, columnar, or transitional. Beneath the epithelial covering there is most commonly vascular fibrous tissue. The common corns and warts are of this type, as also are gonorrhœal warts, condylomata and mucous tubercles.

An Adenoma is a tumour composed of tissue closely resembling gland tissue. They vary in hardness according to the amount of fibrous tissue which is present; where the fibrous tissue is present in any quantity the tumour is called a *fibro-adenoma*. Adenomata are incapable of producing the secretion of the gland in which they arise. These tumours are common in the breast, prostate, thyroid, &c.

Treatment depends upon the organ in which they grow. As a rule, they can be readily removed, and do not recur if the removal is complete.

2.—Malignant Epithelial Tumours.

Carcinoma.—These tumours arise from epithelial structures, but are, as a rule, quite atypical in microscopic appearance. Masses of epithelial cells grow down, and invade the underlying mesoblastic tissue. The connective tissue thus invaded undergoes a chronic inflammation from the irritation caused; this chronic inflammation results in the formation of fibro-cicatricial tissue, which eventually becomes the stroma of the tumour. The stroma, therefore, surrounds the masses of cells, but *does not pass in between the individual cells* (*cf.* Sarcoma). It varies in amount in different types of tumour.

Carcinomata are very malignant, spreading both by

* A sterilized culture of *Streptococcus pyogenes* and *Micrococcus prodigiosus*, which is injected into the tissue of the tumour.

direct extension and by way of the lymphatics, the lymphatic glands being therefore early involved. Secondary growths occur in the viscera and other parts of the body.

Carcinomata are classified according to the type of epithelial cells present:—

(a) Squamous Carcinoma or Epithelioma.—Like other varieties of carcinoma, this type occurs most commonly in elderly people, that is to say, from forty years and upwards. Any part of the skin or mucous membrane, where squamous epithelium occurs, may be the site of an epithelioma. Chronic irritation appears to be a strong predisposing cause. This type of tumour is common upon the lips and tongue (*q.v.*).

Microscopically, the tumour consists of masses of irregular, squamous epithelial cells, embryonic in type, embedded in a fibrous stroma. *Cell nests* occur in the epithelial columns. In the centre of the cell nest are a few large squamous cells, surrounded by layers of crescentic cells. These cell nests only signify rapid cell growth; hence, though more frequent in malignant tumours, may be met with in rapidly progressing innocent epithelial growths.

Clinically, an epithelioma begins as a hard warty growth, which rapidly increases in size, and as a rule soon ulcerates. The typical ulcer has an unhealthy, sloughy base, with indurated and everted edges. The neighbouring lymphatic glands are involved early; the tumour soon involves underlying tissues. As a rule there is no great pain. In some cases the superficial growth is more extensive, a large cauliflower-like mass being formed. In other cases the growth may be comparatively slow, with little ulceration; under these circumstances there is a large amount of fibrous stroma.

(b) Spheroidal-celled Carcinoma.—Two varieties are recognized, the hard *scirrhus* and the soft *encephaloid* cancer.

In the *scirrhus* cancer there is a comparatively large amount of fibrous tissue, while the cells are less numerous. It is a very hard, relatively slow-growing tumour, which on section shows a yellowish white surface which grates when cut with a knife. The appearance of the cut surface has been compared to a section of an un-

ripe pear. Microscopically, the cells present are seen to be spheroidal in shape. Fatty degeneration is common. Ulceration occurs when the growth reaches the surface.

Clinically, the most common situation is the female breast. The stomach, prostate, pancreas and skin may also be affected. It forms a very hard tumour fixed to the skin and to underlying tissues, frequently ulcerated; the neighbouring lymphatic glands are early involved.

Encephaloid carcinomata are rarer than the scirrhous type. There is little stroma, the cellular elements predominating. The individual cells are larger. The tumour is much softer and grows more rapidly; it is often very vascular. The breast, stomach, kidney and upper jaw are most commonly involved. The course of the disease is very rapid, secondary growths being formed early, hence the term *Acute cancer* which has been applied to this variety. A type of change known as *colloid degeneration* often occurs, the epithelial cells being replaced by gelatinous material.

(c) **Columnar-celled, or Glandular Cancer,** most frequently affects the stomach and intestines, especially the rectum. Microscopically, it shews alveoli lined with columnar epithelium, embedded in fibrous stroma. These alveoli are very irregular in shape, and the stroma is rather loose, these two points helping to distinguish the condition from a simple adenoma.

Clinically, it is much like the other varieties, the rapidity of its growth depending upon the proportionate quantity of cells present. Colloid degeneration may occur.

Treatment.—Early and complete extirpation of the growth, with the neighbouring lymphatics, is the only treatment from which cure may be expected. The difficulty of complete removal, however, renders the prognosis always grave. X-rays may be used in inoperable cases.

(III) **Endotheliomata.**— As has been foreshadowed above, there is considerable difference of opinion as to what tumours should be included in this class. The so-called "mixed tumour" occurring in the parotid gland is generally supposed to be endothelial in origin.

as also are certain rare growths found in the meninges known as *Psammomata*.

The treatment, as with other malignant growths, is removal whenever possible.

(**IV**) **Teratomata** are complex tumours arising from the inclusion of part of another embryo. They may contain hair, teeth, nails, nipples, and even muscle or bone.

CHAPTER XV.

CYSTS.

A CYST is a closed cavity whose contents are either fluid or semi-solid. Some cysts are neoplasms, others are not.

Cysts may be classified as follows:—

(I) Cysts of embryonic origin.
(II) Cysts arising from the distension of the pre-existing spaces.
(III) Cysts of new formation.

(I) Cysts of Embryonic Origin.

(a) Sequestration Dermoids.—At certain parts of the body of the developing embryo clefts are present which, during development, close up. The two boundaries of the cleft are covered with epithelium. Sometimes when these two boundaries coalesce, and the cleft is obliterated, part of their epithelial covering is caught inside the cleft, and cut off from the general epithelial covering of the body. This little islet of epithelium may give rise to a cystic swelling, lined with epithelium, closely resembling skin or mucous membrane. These dermoid cysts usually contain sebaceous cheesy material, while hair frequently grows from the epithelial lining.

The common positions possible for these cysts may be guessed at from a knowledge of embryology. The middle line of the neck, the side of the neck in the positions once occupied by the branchial clefts, behind the outer angle of the orbit, and at the sutures of the skull, are situations where dermoids frequently appear. They always develop during the first few years of life.

(b) Tubulo Dermoids.—These are cysts developed in connection with canals, present in the embryo, but normally disappearing before birth. The thyroglossal cysts in the neck, developed from remnants of the thyroglossal duct are of this type.

Clinically, both these varieties of dermoids form

firm cystic swellings, not attached to the skin, but frequently fixed to underlying tissues (*cf.* sebaceous cysts); they do not give rise to pain. The diagnosis is generally easily made from the position and history of the tumour.

Treatment.—Dermoids are usually easily removable. The whole lining membrane should be dissected away if possible, in order to prevent recurrence. If this is impossible, the actual cautery should be applied to those parts of the lining which are left behind.

(c) **Odontomes.**— *See* Diseases of the Jaws, p. 190.

(d) **Cysts** connected with rudimentary sexual organs, such as Wolffian or Müllerian ducts.

(II) Cysts due to the Distension of Pre-existing spaces.—These cysts may be due either to the blocking of the duct of a gland and consequent retention of secretion, or to increased secretion in a cavity which has no duct.

A Sebaceous Cyst is due to the blocking of the duct of a sebaceous gland. It is a smooth, round, cystic swelling, attached to the skin, but not to underlying structures, which serves to distinguish it from a dermoid cyst (*q.v.*). If left untreated, it may attain large size, or may become infected and suppurate. It usually contains a quantity of cheesy material.

The diagnosis from an abscess may be extremely difficult before operation, especially if suppuration has occurred. It differs from a lipoma in being firmer, and in not possessing the characteristic lobulations, and therefore not giving rise to the surface dimpling on manipulation.

Treatment.—The cyst should be entirely dissected out, and the resulting wound treated on general lines, as indicated in Chapter VI (Wounds).

A Mucous Cyst is a similar condition occurring in mucous membranes, notably in the mouth. It is usually sufficient to puncture the cyst aseptically, and let out the fluid contents.

Cysts of this type occur in various organs, notably the breast, thyroid (*q.v.*), &c.

(III) Cysts of New Formation are of various kinds.

(*a*) **Parasitic cysts** due to the presence of a parasite. The most common variety is the *hydatid cyst*, due to the presence of *Tænia echinococcus*.

(*b*) Cysts formed by the extravasation of blood or serous fluid into the tissues (*blood cysts* and *serous cysts*). If any treatment is required, a simple aseptic puncture will generally be sufficient.

(*c*) When a foreign body is present for any length of time in the tissues (*e.g.*, a bullet), a cyst may form around it. The treatment is to remove the foreign body.

Cysts also form as the result of degeneration in solid tumours. These are called *cysts of degeneration*.

CHAPTER XVI.

INJURIES OF BONE.

Contusions.—A bone may be bruised by a blow, the force of which is not sufficient to fracture it. If the skin is unbroken, and the patient otherwise in good health, a simple periostitis results, which rapidly heals with rest and the application of evaporating lotions (*e.g.*, lot. plumbi.). If the skin be broken, or if the patient's resistance is below the normal, suppuration may occur. These conditions are discussed in Chapter XVII, under Acute Traumatic Periostitis.

Fractures.—Many terms are used to describe the various types of fracture, which require some explanation. A *simple* fracture is one in which the skin or mucous membrane is not broken; when a breach of surface has occurred communicating with the fracture, it is called *Compound* (*cf.* Dislocations).

A *multiple* fracture is one in which the bone is broken in many places; when a bone is crushed into several small fragments it is said to have sustained a *comminuted* fracture. Sometimes one fragment is driven into the other, so as to fix it; this is known as an *impacted* fracture. *Greenstick* fractures occur in children, because their bones are somewhat softer than those of adults. The bone is bent in a curve, until the outer part gives way, while the inner part is not fractured, just as a bit of green wood may be incompletely fractured.

Method of Union.—This process does not materially differ from the description of healing of wounds, except for the fact that bone is formed instead of scar tissue.

If the two broken ends of the bone are in apposition, and asepsis has been maintained, the process is as follows: First, the blood-clot which invariably surrounds fractured ends of bone is invaded and absorbed by leucocytes, and rapidly replaced by granulation tissue. This is known as the *provisional callus*, and

consists of two layers, an external layer formed by the periosteum, and an internal layer formed in line with the medullary cavity. The provisional callus becomes firmer, and begins to ossify during the third week; ossification is usually complete in about six weeks from the time of injury.

Between the two layers of the provisional callus is a space corresponding, more or less, to the actual width of the osseous tissue in the normal bone, as it existed before the fracture; that is to say, the distance between the periosteum on the outside, and the outer border of the medullary cavity on the inside. This space now becomes filled up with granulation tissue, in which ossification rapidly takes place, generally being completed about three months from the date of the injury. This last formation of bone is known as the *definitive callus*, and it is by means of this tissue that the union ultimately takes place. As soon as the definitive callus is completely ossified, absorption of the provisional callus commences. This process of absorption may last a year or more.

Sepsis has a similar effect upon the healing of a fracture as it has upon a wound, rendering the whole process lengthier, and the callus, though formed in excessive quantity, is frequently inferior in strength.

When the ends of the fragments are not in correct apposition, it will be clear that union will be delayed, as the actual amount of callus required will be greater; the ultimate shape of the bone will, of course, be faulty.

Anything intervening between the two ends, such as a piece of torn periosteum, will considerably delay, if not entirely prevent, union.

Fractures are common during the first two or three years of life. From about 3 years old till 7 they become rarer. From 7 upwards they increase in frequency. In childhood and adult life the male sex is more often affected, but in old age the reverse is the case.

Certain diseases of bone predispose to fracture, *e.g.*, rickets (*q.v.*), osteomalacia, tumours, &c.

The exciting cause of fracture is almost always injury, either direct or indirect. In certain cases, a bone may be broken by muscular action alone, notably

the patella; while in very severe disease of the bone, the fracture may be apparently spontaneous.

General Clinical Signs —

(1) *History and signs of local injury, e.g.*, pain, tenderness, bruising, and if a few hours have passed, considerable swelling.

(2) *Increased mobility* of the part, unless the fracture is impacted.

(3) *Deformity* of the part, and alteration in the relative position of the bony points.

(4) *Loss of power* of movement of the part.

(5) *Alteration in length* of the limb.

(6) *Crepitus.*—A grating feeling which may be detected when the two fragments are made to rub against each other. This sign cannot, of course, be elicited if the fracture be impacted.

(7) *Fever.*—Slight as a rule, unless the fracture be compound.

(8) *Shock*, which varies in severity, according to the extent of injury sustained by the soft parts, the amount of hæmorrhage, &c.

Diagnosis.—In most cases the presence of a fracture is obvious at once. Difficulty may be experienced when a dislocation is present with the fracture. X-rays should always be employed to aid in the diagnosis when possible.

The presence of a form of crepitus due to some other cause may be puzzling. There is a form of teno-synovitis (inflammation of the tendon sheaths) which often occurs in the tendons around the wrist in washer-women. This is accompanied by swelling and soft crepitus, and may be mistaken for a fracture of the radius, especially as the patient often gives a history of some injury to which she attributes the condition. The absence of the typical deformity should determine the nature of the case. If there is any doubt, the use of X-rays will clear up the matter at once.

Treatment.—No definite methods of reduction, such as are given for the reduction of various dislocations, can be described; each fracture requires to be dealt with as the particular case demands. In most cases a combination of traction and manipulation of the fragments is required. An anæsthetic is of great

assistance in overcoming muscular resistance, as well as for the relief of pain. In certain cases, especially in very old people, impaction may be the best possible thing for the patient. But in most cases impacted fractures must be broken down, so that the fragments may be replaced in correct apposition.

When the correct position of the fragments has been attained, means must be taken to ensure their remaining in this position till union has occurred. Splints of various kinds are used; where splints cannot be applied, as in the case of a fractured rib, strapping may be useful. Where no appliance of this sort will suffice to retain the fragments in position, operative treatment, *e.g.*, wiring or screwing the fragments together, may be required.

If the patient is seen immediately after the injury, splints may be applied at once in the hope of limiting the amount of swelling. If, however, swelling has already commenced, a temporary dressing must be applied until the swelling has subsided.

Before applying a splint, the part must be carefully cleaned, and dusted over with a little boracic powder to prevent itching. Care must be taken to pad the splint thoroughly, and to apply it firmly enough to retain the bones in position, but not so tightly as to impede the circulation or injure the nerves.

Always see your patient again within twenty-four hours of applying the splint, to make sure that no pressure upon vessels or nerves is caused by the apparatus. If any signs of pressure are present, the whole apparatus must be removed, and reapplied less firmly.

Massage and passive movement of the part form an important part of the treatment. The time at which they should be commenced naturally varies with the position and extent of the injury, and no rigid rule can be laid down. As a rule, in a simple uncomplicated fracture in a limb, massage may be begun on the day after the injury, and passive movements a few days later. The splint may often be removed after a fortnight, and in a month the patient may begin to use the limb. It must be fully understood that the times given above will require adjusting to meet the requirements of each individual case. Compound fractures,

and those in which severe injury to the soft parts has occurred, require operative interference; the question of amputation must be considered in very severe injuries.

Non-union.—In some cases where a fracture is associated with severe disease of the bone, the vitality of the tissues may be lowered to such an extent that no attempt at union is made. This is also frequently the case in extreme old age.

In other cases, the fragments may be united by fibrous tissue, without the formation of new bone. This fibrous union commonly results if the fragments are put up in a very faulty position.

When failure of union occurs, a *false joint* may result. The ends of the fragments become covered with cartilage or bone, and slightly altered in shape so that they may glide one upon the other, a bursa usually being formed between them.

Special Fractures.—In this section the signs and treatment of fractures of the bones of the head will be briefly described.

Skull.—Fractures of the skull are of importance mainly on account of the possible consequences of injury to the brain. They are conveniently divided into fractures of the base and of the vault of the skull.

Fractures of the base may be due to direct or indirect violence, and are generally of the fissured variety. They are almost invariably compound, from the involvement either of the ear, the nose, or one of the air-sinuses. The fracture may involve either the anterior, middle, or posterior fossa of the skull. In the first case blood, and sometimes cerebrospinal fluid, is discharged from the nose; extravasation of blood under the conjunctivæ and in the loose tissue around the eyelids occur. When the middle fossa is affected, the hæmorrhage and discharge of cerebrospinal fluid occurs from the ears. If the fracture involves only the posterior fossa, the signs are less pronounced; extravasation under the scalp in the occipital region may be present. The site of the lesion may be further localized by symptoms dependent upon injury to the brain, such as paralysis of limbs, or of cranial nerves, &c.

Fractures of the vault are commonly due to direct

violence; they may be fissured, depressed, or punctured. In slight cases no symptoms beyond those of a simple contusion may be present, in which case the fracture may easily remain unrecognized. If cerebral symptoms are present, they will take the form either of concussion or compression of the brain.

The symptoms of *cerebral concussion* make their appearance immediately after the injury. The patient appears to be unconscious, but can be roused sufficiently to answer "Yes" or "No" to questions, by shouting in his ear. The pulse is rapid and weak. The pupils readily react both to light and accommodation. Fæces and urine may be passed involuntarily. As recovery commences vomiting frequently occurs.

Cerebral compression is a more grave condition, and usually results from a more violent injury. The onset of symptoms is slightly delayed, perhaps for a quarter of an hour. The patient becomes unconscious, and cannot be roused by external stimuli. The pulse is slow and irregular; the pupils do not react to light or accommodation. Retention of urine is a frequent symptom; vomiting does not occur.

Treatment.—Speaking generally, if a fracture of the vault of the skull is diagnosed, operative treatment should be undertaken at once. In slight fissured fractures, where no signs of compression are present, it may be permissible, perhaps, to delay operation in the hope of avoiding it altogether. It may then be treated as a contusion, by means of ice-bags and rest.

Fractures of the base rarely admit of operation, and are frequently fatal. "Expectant treatment"—*i.e.*, rest, the application of cold, and the avoidance of sepsis, as far as possible—is all that can be done.

Nasal Bones.—Fracture of the nasal bones is generally due to direct violence, and frequently involves both bones and also the septum nasi. There is pain and swelling of the part, while crepitus can often be detected. Surgical emphysema (air in the tissues) may occur. Severe epistaxis is a common symptom.

Treatment.—In most cases, it is a simple matter to replace the fragments by means of a blunt, padded instrument in the nostril and a finger outside. If the patient is careful, it is often possible to retain the bones in position without a splint. Otherwise, a

gutta-percha splint may be applied outside, and the nostril plugged with lint. This plugging must frequently be changed, and the nose washed out with an alkaline lotion. For cases in which great difficulty is experienced in retaining the fragments in position, more complicated apparatus has been devised, of which Cobb's nasal splint is the best known. The condition may be complicated by fracture of the nasal process of the frontal bone, the ethmoid or the lachrymal bone.

Lachrymal Bone.—Fracture of this bone rarely occurs, except in association with fracture of the nasal and ethmoid bones. The injury is not of any great importance except in so far as it causes pressure upon the lachrymal duct. An attempt should be made to replace the fragments by means of a blunt instrument through the nose. The nasal duct must be kept patent by the passage of a probe through it.

Malar Bone.—When this bone is fractured, it is generally a part of an extensive injury in which the superior maxilla and other bones are involved; the antrum of Highmore is frequently injured, and this latter complication renders the fracture compound. The body of the bone is most commonly injured. There is considerable pain, swelling and discoloration, and a distinct flattening of the side of the face. Crepitus and mobility of the fragments are signs which can rarely be made out. If the injury affects the antrum, severe unilateral epistaxis may occur.

The zygomatic arch may also be broken; this is a rarer injury; there is obvious displacement of the fragments, which renders the diagnosis easy.

Treatment.—An attempt should first be made to replace the fragments with the help of a finger inside the mouth. This method does not often meet with success. Operative measures will then be required. An incision is made through the buccal mucous membrance in the neighbourhood of the canine fossa, the site of the injury being reached through the antrum, which cavity is afterwards packed with gauze. The danger of sepsis with this method is considerable. The fracture may also be reached through an external skin incision; the danger of sepsis is thus avoided, and the operation rendered much easier, but a scar will be left in a prominent position on the face.

Superior Maxilla.—Fractures of the body of this bone follow direct violence, such as a gun-shot wound or the kick of a horse. The nasal, ethmoid, or malar bones are often involved as well; the fracture is generally compound.

The diagnosis is usually easy from the history of the injury, and the displacement and abnormal mobility of the fragments of the bone.

Slight fractures of the alveolar process accompany extraction of teeth; no treatment is required for this variety.

Treatment of Fractures of the Body.—The chief point in the treatment of the condition is cleanliness. When the fragments have been carefully replaced by means of the fingers or blunt instruments, great care must be taken in washing out the mouth and keeping it clean. If possible, the patient should be fed by the rectum for the first few days at least. In many cases no splint need be applied, the jaws being kept closed by means of a four-tail bandage. If the fragments cannot be kept in place in this way, a splint must be used. Many types of apparatus have been devised, of which the Gunning splint, and the Hammond's wire splint (*see* Fractures of Mandible), are examples. Each case will probably require a special apparatus; the point to be aimed at being to retain the fragments in place with some apparatus that is readily kept clean.

Mandible.—Fracture of the lower jaw is a comparatively common accident, and one, moreover, which is frequently referred to the dental surgeon for treatment. It will be necessary, therefore, to consider the condition somewhat in detail.

It most commonly occurs as the result of direct violence, and affects adults more often than children or the aged. The more or less friendly encounters with which the lower classes love to wile away the hours of Saturday night are responsible for the majority of these injuries. Gun-shot wounds may also result in such an injury.

Occasionally the lower jaw may be fractured by indirect violence; for instance, lateral compression from both sides may result in a fracture near the symphysis.

The body of the bone is most frequently injured.

A fracture may occur at any point from symphysis to angle. The most common positions are in the region of the canine tooth, between the first and second molars, and behind the third molar; the frequency being in the order named.

The injury is almost invariably compound. The amount of displacement varies considerably with the situation of the injury and the amount of violence which causes it. If the injury is bilateral, the displacement is much greater. The posterior fragment is usually drawn upwards by the masseter, temporal and internal pterygoid muscles. In a unilateral fracture there is often little or no displacement of the anterior fragment, but when the body is broken on both sides the depressors of the jaw draw the anterior fragment downwards.

The alveolar process frequently undergoes slight injury during the extraction of teeth, small portions being torn away. No treatment is necessary (cf. *Superior Maxilla*).

The Ascending Ramus may be fractured from similar causes to those described under fracture of the body. There is, as a rule, little or no displacement, but the swelling and bruising of the soft parts is often considerable.

The diagnosis of a fracture of the jaw is usually simple; the history of the injury and the obvious displacement of the fragments being clear indications of the condition.

Treatment.—The great essential in the treatment of a fracture of a mandible may be summed up in the one word, *cleanliness*. It is obvious that the situation of the lesion renders cleanliness most difficult to obtain, especially if the patient is fed by the mouth. The patient is, of course, unable to masticate food, so that any nourishment given by the mouth must be in liquid form; and it is well-nigh impossible to prevent the food from collecting around the teeth and the site of fracture. Under these circumstances, cleanliness cannot be satisfactorily maintained. It is wise, therefore, for the first few days at least, to suspend mouth feeding altogether, and to feed the patient by the rectum. If this is done, and the mouth frequently washed with hydrogen dioxide lotion, rapid healing may be induced.

The teeth should be carefully scaled, and all septic teeth extracted.

The displacement is usually easy to reduce, but it is by no means easy to retain the fragments in a correct position. Some form of appliance to fix them will, therefore, be required. A few cases, where there is little or no displacement, have been successfully treated by the application of a four-tail bandage alone, but these cases are uncommon. In the great majority of these injuries an internal splint will be required, and for the successful adaptation of such a splint an impression is necessary. The operation of taking a correct impression without causing considerable pain to the patient necessitates very delicate manipulation, which cannot be learnt from a book. Students should take every opportunity of seeing this operation actually performed; and in hospital practice these opportunities are not rare. Soft wax is the material usually chosen in that it does not tend to push the fragments out of place, and that absolute accuracy is not an essential.

Many varieties of splint have been devised, and widely different opinions are expressed as to the relative value of these appliances. The *Tomes's Splint*, which consists of a metal cap, struck up to a zinc to cover the tops of the teeth, and fixed to them with osteo, makes, as a rule, a very satisfactory appliance.

Hammond's Wire Splint consists of soft iron wire bent up to fit both lingual and labial surfaces of the teeth. The displacement having been corrected, the splint is placed in position, and fixed to the teeth by means of binding-wire.

The *Gunning Splint* is an apparatus composed of vulcanite, which covers both the upper and lower teeth, a four-tail bandage being subsequently applied. An important disadvantage under which this splint labours is the difficulty of keeping the mouth clean. It may be useful when both jaws are fractured.

The *Cradle Splint*, suggested by Lewin Payne, consists practically of two Hammond's splints, one for the lower and one for the upper jaw. The two splints are connected by upright wires, both on the labial and lingual aspects of the teeth. Silver wire is commonly employed in making this splint. This is a much

cleaner apparatus than the Gunning splint, and seems to be equally efficient in keeping the fragments in position. It is especially useful in cases where the fracture is far back, and may be adapted to fracture of the upper as well as the lower jaw.

If an external wound is present, it must be treated on general lines, that is to say, washed out with hydrogen peroxide, and dressed aseptically. In most cases the splint must be kept in position for six or eight weeks.

If the site of the fracture is far back on the body, or on the ascending ramus, the diagnosis is more difficult, and the displacement cannot be easily corrected by means of splints. The use of X-rays in determining the seat and character of the lesion is here of great value. The only splint which is likely to be useful in these cases is the *cradle splint*.

In most cases of a fracture far back, however, it will be necessary to expose the bone by operation, and wire the fragments together. The danger of sepsis is considerable.

Hyoid Bone.—Fracture of the hyoid bone is not common. It results from direct violence, such as strangling or hanging. The signs of the injury are characteristic, *viz.*:—

(*a*) Great pain on moving the tongue, neck, or lower jaw.

(*b*) Swallowing is almost impossible.

(*c*) Marked dyspnœa, accompanied by a hoarse, metallic cough.

(*d*) Swelling and bruising over the position of the hyoid bone.

Treatment.—The fracture should be reduced by manipulation, one finger being placed in the mouth, and the other hand outside on the front of the neck. A moulded splint of poroplastic material may be applied, like a collar; but in most cases, if the patient be kept absolutely quiet, fed by the rectum, and forbidden to talk, or move the tongue, neck, or mandible, no splint will be required.

CHAPTER XVII.

DISEASES OF BONE.

Inflammatory Affections.—For descriptive purposes, the inflammatory affections of bone are classified according to the situation of the lesion into three divisions:—

(1) *Periostitis;* (2) *Osteitis;* (3) *Osteomyelitis.*

Strictly speaking, these terms imply inflammation of the periosteum, the bone, and the medullary cavity, respectively. But it is important to realize at the outset that in practice no such definite limits exist. Where the periosteum is inflamed, the underlying bone is always affected to a greater or less extent while disease involving the medullary cavity invariably affects the bone surrounding it. In a similar way, if the bone itself is first affected, either the periosteum or medullary cavity, or both, are soon involved.*

Necrosis of bone means the death of a definite piece of bone, or, in other words, gangrene of bone (*q.v.*). It may follow either acute or chronic disease of bone, and results in the complete separation of the necrotic portion; the separated fragment of bone is known as a *Sequestrum.* The method of separation of a sequestrum is similar to the casting of a slough. Ulceration around the necrotic portion of bone occurs, whereby a line of separation is formed, which is filled up by granulation tissue; this is due to inflammation of the living tissue nearest to the necrotic piece (*cf.* Gangrene, Chapter V).

New bone is subsequently laid down around the sequestrum. This new bone is not complete, but is pierced by several holes. The new bone is called the *involucrum*, and the holes which pierce it are termed *cloacæ.*

* Dental students must be careful not to confuse the periostitis here mentioned with dental periostitis, or, more properly, periodontitis, with which it has nothing whatever to do.

Acute Traumatic Periostitis is an acute localized inflammation of the periosteum and underlying bone, following injury. An open wound is not necessarily present. In slight cases, recovery may occur without suppuration, leaving the bone somewhat thickened. When the injury is severe, or when infection through an open wound occurs, pus is formed between the periosteum and bone. The pus strips up the periosteum off the bone, leaving a small surface of bone uncovered by periosteum. This portion of bone dies, and is thrown off as a sequestrum by the process described above.

Clinical Signs.—Severe pain is present at the site of injury; the pain usually becoming worse at night. The part is tender and swollen. If suppuration occurs, the skin is red and inflamed. If the pus discharges through the skin, a sinus results.

Treatment.—In the non-suppurative form, complete rest of the limb in an elevated position, and the application of fomentations will usually suffice. If suppuration occurs, the pus must be evacuated by means of an incision. When a sequestrum is formed, it will require to be removed as soon as it is completely separated; the process of separation usually takes about six weeks.

Acute Osteomyelitis is the term commonly applied to a condition which affects medulla, bone, and periosteum. It commences, as a rule, either in the medullary cavity or just beneath the periosteum. The typical position for the disease to begin is close to the epiphysial line on the shaft side. The disease is common in children, either after an acute specific fever or some slight injury in a debilitated patient. Some time ago it was a frequent sequela of amputation, but since the introduction of aseptic methods this complication of amputation has practically disappeared.

Whether the disease starts centrally or beneath the periosteum, it rapidly involves all the three tissues, spreading along the medulla, and also stripping up the periosteum. When it begins in its typical position, the epiphysis usually escapes altogether on account of its more efficient blood supply. In certain cases, however, the disease may begin in the epiphysis, and remain localized there (acute epiphysitis). If the

epiphysial line is within the capsule of the joint, a septic arthritis will probably supervene.

The most common organism present is the *Staphylococcus aureus* or *albus*. Streptococcal osteomyelitis is rare.

Clinical Signs.—The onset is sudden. Severe pain, tenderness, redness and swelling of the part (generally in a limb) are present, accompanied by marked pyrexia, headache, and often delirium. Where the bone is superficial (*e.g.*, the tibia) fluctuation may be made out. General pyæmia may occur; infective emboli may pass off in the blood-stream, giving rise to pyæmic abscesses, malignant endocarditis, &c.

Diagnosis.—This condition should always be suspected in a child with pain and tenderness in a limb bone, especially if the temperature is raised. *Growing pains* are never severe, and are unaccompanied by any marked constitutional symptoms. *Acute rheumatism* is very rare in children.

Treatment.—Immediate operative treatment is essential. A free incision must be made, the pus evacuated, and the diseased portions of bone scraped away. If it is doubtful whether the medullary cavity is involved, it may be wise to wait twenty-four hours after the first incision has been made to see if improvement takes place. It is clearly undesirable to make an incision into an uninfected medullary cavity and thus render it liable to infection. But if the temperature does not fall rapidly, the medullary cavity must be freely opened up and scraped. The wound should be plugged with gauze to ensure healing from the bottom. The wound will require frequent irrigation with hydrogen peroxide; the limb should be kept at rest, a splint being applied if necessary.

If necrosis occurs, as is almost invariably the case, the wound must be kept open until the separation of the sequestrum. The sequestrum must then be removed by operation, when rapid healing will occur.

Amputation is required in certain cases, *e.g.*, when the occurrence of rigors suggests the onset of pyæmia. But the decision is of so grave a nature that the greatest experience is necessary.

Chronic Inflammation of Bone.—Two varieties of chronic inflammation occur in bone, *viz.*, *Rarefactive Ostcitis* and *Sclerosis*.

Rarefactive Osteitis is most commonly the result of tubercle. Syphilis is a less frequent cause, while the condition may also result from the pressure of a neoplasm or aneurysm. The solid bone becomes absorbed, and replaced by granulation tissue; there is definite increase in size of the Haversian canals, which results in the bone being lighter than usual. When a portion of bone is completely replaced by granulation tissue the condition is known as Caries (ulceration of bone). In the later stages the granulation tissue may become softened, with the formation of an *abscess*. Sequestra are often formed.

Sclerosis of bone is practically the converse of the condition just described. A deposition of new bone occurs, both beneath the periosteum and also in the Haversian canals; in some cases the Haversian canals may be completely obliterated by this new formation of bone. A sclerosed bone will naturally be heavier than normal. The vascular supply is interfered with to a greater or less extent; this interference with the blood supply may result in *necrosis* of the bone.

The most common causes of sclerosis of bone are syphilis, injury, or any chronic irritation of the bone.

In some cases a rarefactive osteitis may occur from inside the bone, combined with sclerosis beneath the periosteum. In this way absorption takes place from inside, while new bone is laid down on the outside, the result being that *expansion* of the bone takes place. The amount of absorption is generally greater than the sclerosis, so that the expanded bone becomes quite thin. The most usual cause of this condition is the presence of a tumour growing from the inside, and causing absorption of the bone, the sclerosis being merely an attempt on the part of Nature to compensate for the weakening on the inside by a new formation of bone on the outside.

Chronic inflammation of bone may depend, therefore, upon some injury or chronic irritation. In these cases it is usually a localized sclerosis, resembling the condition described as acute traumatic periostitis, but differing from it in being chronic in character. Clinically, the condition is very similar to the acute variety, the signs being less marked and the onset slower. Fever is often absent altogether.

Treatment consists in rest of the affected part; if a limb is involved it should be kept in an elevated position. Counter-irritation to the part, *e.g.*, by painting the skin with iodine, may be useful. For the relief of pain sodium salicylate gr. x should be given internally three times a day.

In obstinate cases, where pain is a marked feature, an operation for the removal of the new-formed bone may be required.

Tuberculosis of Bone.—There is no essential difference in the pathological features of tuberculosis in bone from the condition described under Tuberculosis (Chapter XII). The grey granulations with giant-cell systems appear, later on undergoing caseation and softening. There is often more irregularity in form when the disease attacks bone, the giant-cell systems being consequently more difficult to demonstrate under the microscope. Very few bacilli are to be found, as a rule. The disease most frequently begins in the cancellous bone, but may begin under the periosteum or in the medullary cavity. The bone is destroyed by a rarefactive osteitis, resulting in caries.

When the disease commences in the centre and runs a very chronic course, a certain amount of sclerosis of the surface bone often occurs. This is the result of the chronic irritation of the disease, but is not, strictly speaking, a tuberculous osteitis. Sequestra are frequently formed in the course of tuberculous disease. Clinically, two types may be described according to the position in which the disease starts. When the surface of the bone is first affected, a painful and somewhat tender, softish swelling may be made out, which sooner or later undergoes caseation and suppuration. Slight fever may be present.

The diagnosis is simple as soon as the stage of caseation and suppuration is reached, but in the early stages it may be very difficult. In the quite early stages *treatment* is carried out on the same lines as for a simple chronic periostitis, so it is not of such great importance to make a definite diagnosis; but the possibility of tubercle should always be borne in mind.

General hygienic treatment, as described under Tuberculosis (Chapter XII), will be required, and rest and counter-irritation of the part by means of iodine or Scott's dressing may be tried.

As soon as there is any sign of suppuration, a free incision should be made and the pus evacuated.

The second clinical variety is that in which the disease commences in the medullary cavity. There is severe aching pain, worse at night, and some general swelling of the part, with slight fever. Later on, when suppuration occurs, a point on the skin becomes red and tender where the abscess is pointing. The diagnosis is extremely difficult to make with certainty until suppuration occurs, though the condition should always be suspected. The *treatment* is the same as for the superficial variety.

Tuberculosis of the Bones of the Face does not differ in symptoms or treatment from the disease in other bones. The most common situations in the face are: the lower margin of the orbit; the frontal and nasal bones; the nasal processes of the superior maxilla, and the alveolar processes of either jaw; the presence of carious teeth is said to predispose to this latter condition.

Syphilis.—In the early secondary stages indefinite aching pains in the bones may occur. Later on, in the secondary stage, *sclerotic periostitis* often occurs, especially affecting the long bones, such as the tibia. It is very similar to a simple chronic inflammation; it may be diffuse in character, but more commonly occurs in patches, which are termed *nodes*. Clinically, the disease gives rise to deep-seated, aching pains, which are worse at night. There is often definite enlargement of the bone to be made out, and this swelling may be somewhat tender.

In the tertiary stage two clinical varieties occur:—

(1) A *diffuse sclerosis* of the bone, both beneath the periosteum and in the medullary cavity. The bones of the skull are most commonly affected by the diffuse variety.

(2) *Multiple gummata*, generally subperiosteal, giving rise to absorption of the bone (*syphilitic caries*). This type is also common in the cranial bones, often giving rise to extensive necrosis.

The treatment of these conditions is carried out on general antisyphilitic lines (*vide* Chapter XII).

In the *congenital* variety, enlargement of the ends of the long bones (*syphilitic epiphysitis*) may occur;

and also a condition in which the cranial bones are markedly absorbed in localized patches, resulting in a condition of *Craniotabes* similar to that described as occurring in Rickets.

The Bones of the Face are rarely affected by the diffuse variety. *Gummata* are fairly common, most usually spreading to the bone from the surrounding soft parts, such as the nose, palate, &c.

Phosphorus necrosis of the jaw is described in Chapter XXIII.

There are several rare diseases of bone which, though of great interest, do not come within the scope of a handbook of this description.

Tumours of Cartilage and Bone.

(A) Simple Tumours.

(1) **A Chondroma** is a tumour composed chiefly of cartilage. These tumours are usually small and multiple. They commonly occur around the metacarpals and phalanges, but may appear in other situations, such as the cartilages of the nose or larynx, or even the parotid gland. (The presence of a neoplasm, consisting chiefly of cartilage in the parotid gland, has been explained as being a remnant of the cartilage of one of the branchial arches.) Calcification, and even ossification, may occur in these tumours. They are not painful, and do not commonly become malignant, so that no treatment will be required unless the deformity they cause renders their removal advisable.

Single chondromata may occur at or near the ends of long bones; this variety undergoes ossification early, and is merely the first stage in the development of the spongy osteoma described below.

(2) **Osteoma.**— Two distinct varieties of osteomata, or tumours consisting chiefly of bone, are met with.

(*a*) *The spongy osteoma*, or exostosis, is a single, pedunculated bony tumour affecting the ends of long bones. In rare cases multiple exostoses occur. As mentioned above, these tumours begin as chondromata, and, even when completely ossified, there remains a cap of hyaline cartilage on the surface of the growth.

The treatment required is removal, if unpleasant symptoms such as pain are caused.

(*b*) *Ivory exostoses* are sessile masses of very hard,

dense, compact bone chiefly affecting the bones of the vault of the skull.

Treatment is not required as a rule. If the tumour is causing alarming symptoms from pressure on the contents of the skull, an attempt must be made to remove it.

(3) **Fibromata** arising from the periosteum occur in two common forms: *Epulis*, affecting the jaw (*vide* Chapter XXIII), and *Nasopharyngeal polypus*, growing from the basilar portion of the occipital bone. These latter tumours often become sarcomatous, and for this reason they should under all circumstances be removed at once.

(B) Malignant Tumours.

Periosteal Sarcomata are those which commence in the periosteum. They may consist either of round or spindle cells, or may be of the mixed variety. They do not cause much pain, but grow very rapidly, and are extremely malignant, secondary growths in the viscera occurring early. Ossification in the tumour often takes place, and spontaneous fracture may occur.

Central sarcomata commence deep in the bone; they are usually of the round-celled variety, but may be spindle-celled or mixed. They cause more pain than the periosteal variety on account of the expansion of the bone which occurs. This process of expansion of the bone has been described above on page 133. These sarcomata grow with great rapidity, and are very malignant.

The diagnosis is often very difficult in the early stages. Considerable assistance may be obtained from X-rays. The great thinning of the bone which occurs in the process of expansion results in a curious crackling sensation when the tumour is palpated. This is known as *eggshell crackling*, and is an important aid to diagnosis.

Treatment.—Amputation at a point well above the seat of the growth gives the only possible hope of cure. But secondary growths are formed so early that the disease is almost always fatal.

Myeloid Sarcoma.—This variety of neoplasm almost invariably occurs in bone. Considerable difference of opinion exists as to whether or not this tumour should

be classed among the malignant neoplasms. Secondary growths are of great rarity; some authorities deny that secondary growths are ever formed, and on this account class the tumour among the simple neoplasms under the name of *Myeloma*. It is very much slower in growth than the ordinary sarcoma. Microscopically, the growth consists of round and spindle cells, in addition to which large, irregular multinucleate giant cells occur. These tumours are very soft and vascular, often consisting of large cavities full of blood. Clinically, there is usually some pain and swelling, but in some cases no signs may appear until a late stage, when spontaneous fracture may reveal the condition, hitherto unsuspected.

The treatment is complete and free removal. If the removal is complete, recurrence is rare.

Secondary carcinomata and *sarcomata* are common in the bones, especially in cases of carcinoma of the thyroid or prostate, and in the melanotic variety.

Tumours of Bones of the Face.—Simple tumours are rare with the exception of fibrous epulis.

Malignant tumours are fairly common; carcinoma, rodent ulcer, sarcoma and myeloid sarcoma may all occur.

CHAPTER XVIII.

INJURIES OF JOINTS.

Wounds.—The severity of wounds which involve joints depends chiefly upon the cleanliness of the instrument by which the wound is inflicted. A *clean wound* is followed by a simple synovitis which, if treated aseptically, commonly heals rapidly. A careful watch must be kept for any sign of sepsis. If a joint is wounded by a dirty instrument, operative interference will be required immediately. The joint should be opened, carefully washed out, and rendered aseptic. If this be not done, a septic arthritis (inflammation of joint) will ensue, and the subsequent treatment be difficult and tedious.

Sprains and Strains include injuries resulting in tearing or stretching of ligaments, synovial membrane, or other structures in immediate relation to the joint. They are due, as a rule, to sudden violence. Considerable pain and tenderness are present, usually accompanied by swelling and discoloration of the part. *Traumatic synovitis* commonly supervenes.

It is important to distinguish these injuries from dislocations and fractures; and the diagnosis may be rendered difficult owing to the great tenderness of the part, and consequent impossibility of thorough physical examination. The chief point to bear in mind is that the anatomical landmarks will be in their normal positions. The aid of X-rays is often of considerable value in diagnosis.

Treatment.—The injured part should be dressed with lead lotion and firmly bandaged to limit as far as possible the effusion of fluid into the joint. Massage and passive movements should be resorted to as soon as possible, but this will naturally depend upon the severity of the injury.

Dislocations.—When two or more bones that normally combine to form a joint become sufficiently disarranged to refuse to reassume naturally their

proper relationship the condition is called a dislocation. Dislocations are classified according to their cause, into three divisions:—

(1) **Congenital Dislocations:** due to some abnormal development or to injury *in utero*. It will be unnecessary to discuss these further.

(2) **Pathological Dislocations:** dependent upon disease of the joint (*vide* Chapter XIX).

(3) **Traumatic Dislocations.**—It is important that the dental surgeon should be possessed of some knowledge of these conditions, as an emergency may easily occur in which he may be required suddenly to deal with a case. Though this is particularly true in dislocation of the mandible, the student should endeavour to make himself familiar with dislocations of other joints.

Predisposing Causes: (1) *Age.*—Traumatic dislocations are rare in childhood and in old age. This is due to the greater frequency of fracture in old age and of separation of epiphyses in childhood.

(2) *Anatomical Features.*—Certain joints are much easier to dislocate than others. The shallow glenoid cavity of the scapula and the comparative laxity of its ligaments renders dislocation of the shoulder-joint a commoner injury than, for example, a similar injury to the hip-joint, where the head of the femur is received into a deep socket and supported by strong ligaments.

(3) *Previous disease* in a joint may predispose to dislocation.

Exciting Causes.—Dislocations are most commonly due to indirect violence, associated with sudden muscular contraction. Direct violence is a less frequent cause; while in a still fewer number of cases, muscular contraction alone, without any external violence, results in dislocation. The joints in which the injury follows muscular contraction alone are chiefly the temporo-maxillary and the shoulder-joint. The patella may also be dislocated in a similar manner.

Dislocations are classified in various ways:—

A.—(1) *Complete*: when the articular surfaces are quite separated.

(2) *Incomplete*: when the articular surfaces are only partially separated.

(or)

B.—(1) *Simple*: when the skin is unbroken.
(2) *Compound*: when the skin is broken (*cf.* Fractures).

When injuries to vessels, nerves, &c., occur the dislocation is called *complicated*. If a fracture is also present, the injury is known as a *fracture-dislocation*.

General Signs—

(1) *History of injury.*
(2) *Great pain and swelling.*
(3) *Immobility of limb,* if no fracture be present.
(4) *Loss of power of movement.*
(5) *Deformity.* On comparing the injured with the sound limb, the bony points will be found to be displaced.
(6) *Alteration of length of limb.*

Diagnosis—

(*a*) *From a Sprain.*—The deformity, loss of power of movement, and alteration in length of limb are important points in favour of dislocation.

(*b*) *From Fracture.*—The immobility of the limb, and the position of the bony points must be noted. An X-ray examination should *always* be made in all cases of injury near a joint, if the apparatus is at hand.

Treatment.—Immediate reduction of the dislocation is the first essential in the treatment. The delay, even of an hour or so, will allow the accumulation of a considerable amount of fluid in the joint, which will render the subsequent treatment much more difficult. The particular manipulations required to effect reduction naturally vary with the position of the injury, but as a general rule, the object of the surgeon is to cause the displaced bone to return by the way it came. The administration of an anæsthetic may be required, more to overcome the muscular resistance, than to avoid discomfort to the patient. In a simple, uncomplicated dislocation, operative treatment is rarely required.

Passive movements and massage should be begun in most cases, in twenty-four hours' time, and active movements soon after; though these limits may have to be exceeded in certain cases.

Fracture Dislocations.—The dislocation should be reduced *first* and the fracture set afterwards. Opera-

tive interference is often required to attain both these objects.

Compound Dislocations are rare, except as part of a very severe injury; they are usually complicated by fracture and by severe injury to soft parts.

Operation is always required (*vide supra*, Septic wounds of joints), and in many cases it may be necessary to resort to amputation.

Special Dislocations—

Mandible.—The mandible is most commonly dislocated forwards; the injury may be unilateral or bilateral. It usually occurs as the result of a blow on the chin when the mouth is slightly open; in some cases muscular action alone may be sufficient. The injury has occurred during the extraction of teeth, when the operator has not been careful to support the mandible. In some patients, where the glenoid fossa is unusually shallow, and the ligaments weak, very little force, such as yawning or excessive opening of the mouth by a prop or Mason's gag, may be sufficient to bring about a dislocation, especially where such an injury has occurred before.

Mechanism.—In the normal movement of opening the mouth, the condyle, accompanied by the inter-articular fibro-cartilage, moves forwards out of the glenoid fossa, on to the eminentia articularis. If this normal movement be increased, the condyle is displaced further forwards into the zygomatic fossa, where it is fixed by the action of the masseter and temporal muscles. As a rule, the inter-articular fibro-cartilage does not follow the condyle as far as this.

Clinical Signs.—The *bilateral* variety is most common. The mouth is slightly open, the mandible being protruded and fixed. There is usually considerable pain; and saliva dribbles away uncontrolled. In the positions where the condyles of the jaw are normally to be felt, definite hollows can be detected, while the condyles can be felt in their new position, further forward. It is often possible, with the aid of a finger inside the mouth, to feel the coronoid process in front of its normal position. The signs of a *unilateral* dislocation are similar but less marked. The jaw is not absolutely fixed, and is *displaced towards the sound side*.

Treatment.—To reduce the dislocation, the condyle must be made to return the way it came; that is to say, it must be depressed below the level of the eminentia articularis, when muscular action will draw it backwards into the glenoid fossa. An anæsthetic is not generally required. The patient should be seated in a chair, and the surgeon, standing in front, places his thumbs, protected by wrapping napkins around them, upon the lower molar teeth, and makes pressure downwards. Considerable pressure may be required before the resistance of the masseters and temporals can be overcome. When the condyles have been depressed far enough, and the jaw is felt to yield, the chin must be raised with the palm of the hand, and pushed backwards. The condyles will then slip back into place, often with a definite snap. It is at this period of the operation that the surgeon's thumbs are in danger of an injury, from the sudden closure of the jaws, hence the precaution of wrapping them in napkins or lint. It is wiser, if possible, to slip the thumbs outwards into the space between the cheek and the teeth, at the last moment; but the pressure on the molar teeth must not be relaxed too soon, and it is better to move the thumbs too late than too early. This dislocation is very prone to recur, and great care must therefore be taken. A four-tail bandage should be so applied that the mouth can be sufficiently opened to allow of fluids being taken: an elastic four-tail bandage is very useful, as it allows a little movement, but not much. This treatment must be continued for at least a week, and the patient must be instructed to exercise great care in mastication, and in such movements as those involved in laughing or yawning, for several weeks. Even with all these precautions, patients to whom this accident has once occurred are very liable to a recurrence of the condition on very slight provocation. In these cases of recurrent dislocation, reduction becomes proportionately easy, some patients becoming quite expert, from personal experience, in reducing their own dislocations.

When a dislocation of the mandible has been left unreduced for any length of time, considerable adhesions will often form in the joint. These adhesions must be broken down under an anæsthetic, and an attempt made to reduce the dislocation. These efforts

are often successful even after two or three months. If they fail, the condyle must be excised.

The Shoulder-joint is more frequently dislocated than any other; this is due partly to the anatomical features of the joint, to which attention has been drawn above (p. 140), and also to the fact that the most frequent cause of the injury (*viz.*, a fall on the outstretched hand or elbow) is a very common occurrence.

The head of the humerus passes out through the anterior inferior part of the capsule, and comes to lie below the glenoid cavity. Here it may remain (*Sub-glenoid dislocation*); but much more commonly it passes forwards and comes to lie beneath the coracoid process (*Sub-coracoid dislocation*). If the force of the injury is very violent, still further displacement may occur, the head of the bone passing forwards to a position beneath the clavicle (*Subclavicular dislocation*). In much rarer instances, the displacement is backwards into the infraspinous fossa (*Subspinous dislocation*).

Clinical Signs.—The following signs are common to all the above forms of dislocation of the shoulder:—

(*a*) The shoulder is flattened, owing to the absence of the head of the humerus from its normal position.

(*b*) The acromion process is unusually prominent, with a hollow beneath it.

(*c*) The head of the humerus may be felt in its new position, which, of course, varies according to the form of dislocation present.

(*d*) If the hand (on the injured side) is placed on the opposite shoulder, the elbow sticks outwards, and cannot be made to touch the side of the chest.

(*e*) The vertical measurement through the axilla is increased; that is to say, it is greater on the injured than on the sound side.

(*f*) Signs of pressure on vessels or nerves may be present.

In *a subcoracoid* dislocation:—

(*g*) The elbow is displaced *outwards* and *backwards*.

(*h*) The head of the humerus is felt beneath the coracoid process.

(*j*) There is no noticeable alteration in the length of the arm.

(*k*) The subscapularis muscle is often torn.

In a *subclavicular* dislocation:—

(*g*) The elbow is again displaced *outwards* and *backwards*.

(*h*) The head of the bone is more difficult to feel, under the pectoralis major, lying upon the second and third ribs.

(*j*) There is definite *shortening* of the arm.

(*k*) The coracoid process may be fractured, or the great tuberosity of the humerus torn off.

In a *subglenoid* dislocation:—

(*g*) The elbow is again displaced *outwards* and *backwards*, but not so markedly as in the two previous cases.

(*h*) The head of the humerus is felt in the axilla.

(*j*) The arm is slightly *lengthened*.

(*k*) Pressure signs are generally marked: there is often great pain from pressure on the brachial plexus, and the radial pulse may be diminished, or even absent.

In a *subspinous* dislocation:—

(*g*) The elbow is displaced *forwards* and *slightly outwards*.

(*h*) The head of the humerus may be felt at the back, below the spine of the scapula.

(*j*) There is no definite alteration in the measurement of the arm.

(*k*) The arm is *rotated in*, and the hand thrown across the chest.

Treatment—A simple dislocation should be at once reduced. This may be effected by manipulation or traction.

(*a*) *Manipulation* should be attempted first. An anæsthetic should be administered, whenever possible. In some cases, especially where the patient is seen immediately after the injury, reduction may occur spontaneously as soon as the patient is under the anæsthetic.

Various methods of reducing this dislocation have been devised, only one of which (Kocher's method) need be considered here.

The patient, if unanæsthetized, should be seated in a chair; if anæsthetized, he should be lying on his back. *An assistant*, standing behind the patient, should fix the trunk and the scapula. *The surgeon*

stands in front of the patient, flexes the forearm to a right angle, and presses the elbow firmly against the side of the chest. This movement brings the head of the humerus against the edge of the glenoid cavity. The arm should then be steadily rotated outwards as far as possible. During this movement, the head of the humerus rotates along the edge of the glenoid cavity, and not in the axis of the humerus. This movement may suffice to reduce the dislocation. If not, the arm, still fully rotated out, should be brought upwards and forwards, almost to a right angle, keeping the elbow towards the chest during the process. This movement relaxes the capsule. The arm must then be sharply rotated inwards, so that the hand goes towards the opposite shoulder and the arm is brought across the chest. This movement generally brings about reduction. The arm is then fixed to the side, and supported in a sling.

It is almost impossible to get a clear idea of this complex series of movements from a description in a book; the student should make a point of seeing the operation performed on the living subject.

(*b*) *Traction* must be resorted to, if the above method fails. An anæsthetic must be given. The surgeon places his knee or his heel (without a boot) in the axilla as a fulcrum, and, grasping the arm at the wrist, makes traction downwards and little outwards, the heel in the axilla pressing slightly outwards the while. Traction must be *steady, never jerky*. When the muscular resistance is felt to have been overcome, the arm is carried inwards across the trunk, the heel still being kept in the axilla, and the head of the bone usually slips into place.

This dislocation is apt to recur from any slight injury. The limb should therefore be kept in a sling during the day; at night it should be secured by a broad bandage around chest and arm.

Passive movements and massage should be begun on the next day; but the arm should not be abducted for at least a fortnight.

After a day or two, the patient may be allowed to use the arm as far as he can while it is in the sling, but should not take it out of the sling, nor attempt to abduct it.

Complications—

Fracture.—If possible, that is, if the fracture is not high up, the dislocation should be reduced first, and then the fracture treated. If this is not possible, operative interference will be required. The fracture must *never* be put up while the dislocation is left unreduced.

Injury to axillary vessels or nerves may require operative treatment. Immediate control of hæmorrhage may be required if the axillary artery be torn. The shoulder should be forcibly depressed, and the subclavian artery compressed against the first rib by means of a key wrapped in lint. *Compound* dislocation of the shoulder-joint is rare, and usually necessitates amputation.

The above two dislocations have been treated somewhat in detail, as they are specially mentioned in the syllabus issued by the Royal College of Surgeons of England. The injuries of the remaining joints will be treated much more briefly; details of displacements of bones being largely omitted, as the student's anatomical knowledge should enable him to supply these for himself.

Elbow joint.—Dislocations of this joint are fairly common in young people. The injury may result in displacement of both radius and ulna, or of one bone alone. The most common variety is a dislocation of *both bones backwards*. In this case, the displacement of the bones is quite easy to determine. The arm will be immobile, unless the dislocation is associated with a fracture of the coronoid process.

Treatment.—If possible, an anæsthetic should be employed. The surgeon stands in front of the patient, and placing his knee in the bend of the elbow, makes steady traction until the muscular resistance is overcome, and flexes the arm across his knee. This is usually sufficient to reduce the dislocation. A dislocation of the radius and ulna *forwards* may occur, usually accompanied by fracture of the olecranon process. It should be treated in the same way as the backward dislocation.

Lateral dislocations are rare.

After a dislocation of the elbow has been reduced, the arm should be kept in a sling, but massage and passive movements should be employed early.

Pulled elbow is a frequent occurrence in young children. It is characterized by severe pain, the arm being firmly fixed in a position midway between pronation and supination. It is often the result of lifting a child up by its wrists. Various theories have been put forward as to the exact anatomical injury that occurs.

Treatment.—The arm should be grasped at the wrist and steadily *supinated*. Some surgeons are of opinion that *pronation* is the better method of treating the condition.

Wrist.—Dislocations *forwards* and *backwards* occur. Neither condition is common. It is important to diagnose between a dislocation of the wrist and a fracture of the lower end of the radius (Colles's fracture): the latter injury is a very common one. If the injury in question is a dislocation the styloid processes of the radius and ulna will be in their normal relation to one another; the hand will not be displaced outwards, and the lower ends of the radius and ulna will be palpable under the skin.

Treatment.—The surgeon should hold the patient's hand, and at the same time grasp the forearm and make steady traction. An anæsthetic, if available, will render reduction easier. It is wise to apply an anterior splint for a few days.

The first phalanx of the thumb may be dislocated by a fall on the abducted thumb, the base of the phalanx being displaced backwards.

Treatment.—The metacarpal bone should be firmly flexed against the palm of the hand, while the phalanges are hyper-extended. Steady traction should be made on the phalanges. The base of the first phalanx should then be pushed forwards, and the whole thumb flexed against the palm. This method is by no means invariably successful, and operative measures may be required.

Hip-joint.—Several varieties of dislocation of this joint are described. It will be sufficient to remember that there are two classes:—

(1) The head of the femur displaced *backwards* either on to the dorsum of the ilium (*Dorsal dislocation*) or into the sciatica notch (*Sciatic dislocation*).

(2) The head of the femur displaced *forwards* either

into the obturator foramen (*Obturator dislocation*) or on to the front of the pubes (*Pubic dislocation*). Great violence is necessary to bring about a dislocation in a healthy hip-joint, and the condition is consequently uncommon. The thigh is, as a rule, flexed and abducted at the time when the injury occurs.

Posterior Dislocation—

Signs.—(1) The limb is *flexed, adducted* and *inverted.*
(2) There is a hollow in Scarpa's triangle.
(3) The head of the femur is felt on the dorsum ilii or in the sciatic notch. It is not easy to feel in these positions.
(4) The great trochanter is raised above Nélaton's line (*i.e.*, an imaginary line drawn from the anterior superior spine of the ilium to the most prominent part of the ischial tuberosity).
(5) The limb is *shortened.*
(6) There is often considerable injury to muscles.
(7) The *great sciatic nerve* may be compressed.

Treatment.—An anæsthetic is required. The patient is placed on his back on a mattress on the floor; an assistant fixes the pelvis. The surgeon first flexes the leg and the thigh, the thigh being still adducted. This relaxes the Y-shaped ligament. The limb is then steadily rotated out and abducted (the two movements being carried out simultaneously), then circumducted outwards, and fully extended so as to bring the limb parallel with its fellow.

Anterior Dislocations—

Signs.—*Obturator variety:*—
(1) The limb is *flexed, everted* and *slightly abducted.*
(2) The head of the femur is felt in the *perinæum.*
(3) The great trochanter is less prominent than normal.
(4) The limb is *lengthened.*
(5) Pain from pressure on the *obturator nerve* may be present.

Pubic variety:—

(1) The limb is *flexed, everted* and *markedly abducted.*

(2) The head of the femur is felt close to the *anterior inferior spine.*

(3) The great trochanter is less prominent than normal.

(4) The limb is *shortened.*

(5) The *anterior crural nerve* and *femoral vessels* may be injured.

The Treatment of anterior dislocations is similar to that described when dealing with the posterior variety, but the movements differ. The first movement of *flexion* is carried out with the limb *ab*ducted; the limb is then rotated *inwards*, circumducted *inwards*, and then extended.

After any variety of dislocation of the hip-joint has been reduced, the patient should be kept in bed with the injured leg fixed to the sound one with a bandage for at least a week. Very careful massage and gentle passive movements may then be commenced. No active movements should be permitted for a period varying from three weeks to a month.

The Patella may be dislocated *outwards* or *inwards;* the former is the most common displacement. It may be due to direct violence when the limb is in a position of extension; or to muscular action especially in cases of genu valgum (knock-knee). The diagnosis is not difficult. The bone is easily felt in its abnormal position, while the intercondylar notch of the femur can be felt.

Treatment.—The thigh should be flexed, and the leg extended, when it will usually be a simple matter to manipulate the bone back to place.

Knee-joint.—Dislocations of the knee-joint are rare. The injury generally follows considerable violence, and there is often great laceration of the soft parts. Dislocation of the lower end of the femur *forwards* is the most common variety.

It should be reduced by means of traction and manipulation; operative interference is required if the dislocation is compound or if the popliteal vessels are torn. The after-treatment is often tedious and difficult owing to the synovitis which commonly supervenes.

Internal Derangement of the Knee-joint.—Under this somewhat vague term are included a number of injuries involving the semilunar cartilages or the crucial ligaments.

Perhaps the most common variety is a dislocation or laceration of the internal semilunar cartilage. It frequently occurs when a man makes a sudden turn of his body while the leg is fixed, *e.g.*, in playing rather late at a ball a little wide on the leg side to turn it towards fine long-leg. The injury is characterized by sudden violent pain, while the knee is fixed in a semi-flexed position.

The immediate treatment is to flex the leg fully, rotate in and quickly extend it.

The after-treatment is very complicated, and need not be dealt with here.

The Ankle-joint may be dislocated in any direction. This injury is often associated with a fracture near the lower end of the fibula, and sometimes of the tibia also.

The diagnosis may be difficult without the aid of X-rays.

CHAPTER XIX.

DISEASES OF JOINTS.

In this chapter it is proposed to deal quite briefly with the more important pathological conditions of the joints generally, and then to apply these general principles to the study of the diseases which affect the temporomaxillary articulation.

The inflammatory affections of joints are classified according to the position of the lesion into *Synovitis* (inflammation of the synovial membrane) and *Arthritis* (inflammation of the articular surfaces). From what he has read in previous chapters in this book, the student will no doubt guess that no real hard-and-fast line can be drawn between these two classes of disease; the division is purely made for the sake of convenience in description. Synovitis and arthritis may each be of two varieties: *acute* and *chronic*.

Acute Synovitis may result from a variety of causes, both local and general, of which the following are the most important: *local causes*, injury or exposure to cold; *general causes*, rheumatism, gout, and gonorrhœa.

The disease is characterized by rapid effusion of fluid into the joint, accompanied by the cardinal signs of acute inflammation, *viz.*, considerable pain, swelling, heat, and occasionally redness of the skin. The limb is, as a rule, instinctively kept in the position which allows most room in the joint cavity.

A correct *diagnosis* of the cause is important from the point of view of treatment. Much may be learnt from the history. A history of local trauma or of hereditary gouty tendency are suggestive points. The particular joint affected is also an aid to diagnosis. For example, an acute inflammation affecting the great toe will suggest the diagnosis of gout. In a typical acute attack of gout the skin has a dark red, mottled, shiny, œdematous appearance which is very characteristic.

A well-known surgeon used, in teaching, to make the dogmatic statement that *an acute inflammatory affection of a single joint in a young man, where there is no history of injury*, is *Gonorrhœal arthritis*. And though perhaps a little sweeping, the statement will probably be found to be correct in an overwhelming majority of cases, and serves to enforce the importance of never forgetting to think of gonorrhœa, in women as well as men. For obvious reasons the patient will rarely volunteer the information.

Another sweeping statement in connection with acute synovitis which may be of value is the following:—

When you feel inclined to diagnose acute rheumatism in a child, **don't.** Acute rheumatism is very rare in children, while the much commoner acute osteomyelitis often gives a very similar clinical picture.

Treatment.—In *gonorrhœal synovitis*, the important point is to treat the gonorrhœa (*q.v.*). Local treatment consists in rest and the application of glycerine of belladonna fomentations.

In *gout*, absolute rest is essential. An alkaline lotion may be applied locally (*e.g.*, a saturated solution of sod. bicarb.), colchicum, lithia, or sodium salicylate may be given internally, either separately or in combination. Some patients seem to react better to one of these drugs, others to another. Alcohol should certainly be forbidden during the acute attack. Into the much debated question of the amount and kind of alcohol to be allowed after the attack has passed it is quite unnecessary for us to wander.

In *traumatic* cases rest and belladonna fomentations will be required in the acute stage, while counter-irritation, by means of Scott's dressing, may be used later on. Massage and passive movements will be necessary to avoid subsequent adhesions in the joint. Where the affection becomes chronic, owing, for instance, to the presence of a loose piece of bone fractured in the injury, a torn piece of synovial membrane, or in the case of the knee-joint, some injury to a semilunar cartilage, operative treatment is usually required.

Acute Infective Arthritis is a much more severe condition, in which all the structures of the joint are involved. Infection may reach the joint *from without* by means of a wound, or *from within* by extension

from acute bone disease, or as part of a general pyæmia. In either case acute suppuration occurs in the joint.

Treatment.—Immediate operative interference is required to evacuate the pus and wash out the joint. In very severe cases amputation may be indicated.

Gonorrhœal Arthritis is merely a further stage of the condition described as gonorrhœal synovitis, the articular surfaces being affected as well as the synovial membrane. The condition should be dealt with on the same lines as for gonorrhœal synovitis.

Acute Arthritis may occur as a complication of one of the acute specific fevers, notably typhoid fever. In these cases a large amount of fluid effusion is usually present.

Treatment by rest and Scott's dressing will usually be sufficient. If a very large quantity of fluid is present, the joint should be aspirated with aseptic precautions.

Simple Chronic Synovitis occurs either as the result of an acute attack, or as following some injury or local irritation, the severity of which is insufficient to determine an acute attack.

Two types are described, according as effusion of fluid or thickening of the synovial membrane is the more prominent feature.

Treatment.—The joint should be dressed with Scott's dressing, and then strapping should be applied; complete rest of the joint must be secured. Where the fluid effusion is large and does not absorb, aseptic aspiration of the joint may be performed. If there is considerable synovial thickening, the administration of iodolysin by the mouth (ʒss three times a day) may assist in its absorption.

In some cases, other structures in the joint besides the synovial membrane are affected; these cases should strictly be called chronic arthritis, but the alteration in name does not involve any alteration in treatment.

Tuberculous Arthritis is a disease common in children and young adults. Those conditions previously mentioned as predisposing causes of tuberculosis generally (*see* Chapter XII), and which may be roughly described as faulty hygiene, have a similar action in preparing the way for tuberculous arthritis.

The actual attack of the disease often dates from

some trivial injury to the joint concerned. In children, the hip-joint is by far the most frequently affected; in adults, the knee-joint perhaps takes first place. The infection may start in various places, *viz.*, the synovial membrane, the periosteum, the bone, or a bursa connected with the joint.

The onset of the disease is usually very insidious, commencing with slight impairment of movement in the joint which the patient scarcely notices, but is detected by the surgeon as slight rigidity in the joint. This may be accompanied by slight, dull, aching pain and a feeling of "weight" in the part. On examination in the early stages there may be little to be made out. The effusion of fluid is commonly very small in amount; definite thickening of the synovial membrane, or of the articular ends of the bones, can in most cases be discovered; the affected joint is usually definitely hotter than the corresponding joint on the other side. It is essential that the opposite joint should be examined at the same time as the diseased one, in order that any slight differences may be detected. In the later stages these signs are increased; the synovial thickening, the rigidity, the pain, and in some cases the effusion. Some muscular wasting may be present, as a result of disuse due to the pain caused by movement of the joint. The general health is usually affected, the patient being thin and pale, with a bad appetite, and often running an irregular temperature. "Starting pains" at night are a very unpleasant feature of the malady; when the patient is awake the muscles are constantly in action, holding the joint rigid and so, as far as possible, avoiding pain; when the patient is asleep the muscles gradually relax, until a movement occurs in the joint, and a sudden "starting pain" results. The so-called *melon-seed bodies* may be formed. If left untreated, suppuration occurs in the joint, accompanied by the formation of sinuses.

The diagnosis is often very difficult, especially in the early stages. In every chronic arthritis, even if there be a history of injury, *always suspect tubercle*. In a simple chronic arthritis it may be quite impossible to exclude tuberculosis with any degree of certainty, but a non-tubercular arthritis will usually clear up under treatment, whereas a tubercular affection will prove far

more obstinate. A neoplasm of the end of the bone may simulate tuberculous arthritis; but the latter is far the more common affection. A skiagram will be of great value in many cases, while assistance may be obtained from such tests as the opsonic index, Von Pirquet's test, &c.*

Treatment.—General hygienic treatment as laid down in Chapter XII should be instituted. Local treatment consists of absolute rest and the application of Scott's dressing. *Extension* of the limb by means of some mechanical device, such as a weight and pulley, should be applied, especially when the knee-joint is affected, in order to keep the two articular surfaces apart.

The injection of sterilized iodoform emulsion is a form of treatment about which very varied opinions are held by different authorities. It seems to be of most value when there is much effusion of fluid. A 10 per cent. solution of iodoform is used, the amount varying according to the joint involved, and the age of the patient. About ʒi is an average quantity in an adult.

Bier's treatment is often of great value. A bandage is applied to the limb, sufficiently firmly to impede the venous circulation while not interfering with the flow in the arteries, thus causing a *passive hyperæmia* in the affected part. The bandage is, of course, applied on the proximal side of the diseased joint.

The course of the disease is very slow even in favourable cases, and the prognosis should always be of a guarded nature.

In certain cases, operative interference is required. Where suppuration has occurred, the joint should always be opened at once. In cases where no suppuration has occurred, the question of operation is very difficult to decide; some surgeons will advise operation much more frequently than others.

Syphilitic Arthritis.—In the secondary stage, slight synovitis may occur, giving rise to slight stiffness and effusion of fluid. No pain is present as a rule. Anti-syphilitic remedies are indicated. In the tertiary stage, a gummatous infiltration of the synovial membrane may occur. The affection is painless, and the quantity of fluid in the joint commonly very large; the condition is

* For details of these tests the student should refer to a larger text-book.

often bilateral. These three points may serve to differentiate between this condition and tubercle, but the diagnosis is often difficult.

Ordinary antisyphilitic treatment should be administered.

Osteoarthritis is a condition, or perhaps a group of allied conditions, known by a variety of names, of which *Rheumatoid arthritis*, *Arthritis deformans* and *Rheumatic gout* are examples. Different authorities use these terms in somewhat different senses; but for the purpose of this book it will be sufficient to group all the varieties under the one heading, Osteoarthritis.

Osteoarthritis is a very chronic disease. Various theories as to its etiology have been promulgated, and many discarded; current opinion seems to favour the view that the condition is infective in origin. The infection may reach the joint through the blood-stream from a septic focus anywhere in the body. Pyorrhœa alveolaris and oral sepsis of any kind are examples of septic foci from which osteoarthritis may originate. The importance of these septic conditions of the mouth and teeth in relation to osteoarthritis is demanding ever increasing attention at the present time, and it is on this account that the disease is of such importance to the dental specialist, as his aid is frequently invoked both in the diagnosis of the cause and in the treatment of the malady.

Two types of the disease present themselves, *viz.*, the monarticular and the polyarticular variety.

The monarticular variety, as its name applies, affects single joints, the large joints being most frequently attacked. The course of the disease is very slow. It commences with pain and stiffness in the joint. In the early stages this pain and stiffness makes its appearance after the joint has been at rest for some time (*e.g.*, on waking up in the morning), and passes off as the joint is exercised. As the disease progresses, the rigidity and pain increase, while crackling noises can be detected in the joint when it is moved. Enlargement of the ends of the bones in the joint takes place. The cartilage covering the articular ends of the bones proliferates, and projections are formed which gradually undergo ossification; the capsular ligament may also become ossified at its attachment to the bone, this

phenomenon being generally described as *lipping* of the ends of the bones. At the same time that this proliferation of cartilage and its subsequent ossification is taking place, the opposing articular surfaces in the joint become worn away at the points where pressure occurs, the bone becoming rarefied and atrophied. These processes result in considerable alteration in the shape and size of the bones entering into the formation of the joint. Movement in the joint becomes increasingly difficult, and, as a result, considerable muscular wasting occurs from disuse.

In the *polyarticular variety*, many joints are involved, the smaller joints being chiefly affected. The disease may begin in one joint, and gradually spread to others, but in most cases, several joints are attacked simultaneously. The pathological and clinical features are similar to those described above.

In the *diagnosis* of this condition, X-rays play an important part, the lipping of the edges of the articular surfaces combined with rarefaction in the centre being as a rule well shewn.

The treatment of osteoarthritis is unsatisfactory, and the prognosis consequently unfavourable. The patient should live in as dry and warm a climate as possible. An ordinary diet may be allowed, plenty of fats being included in it. Any septic focus that is discovered must be treated, and any roots or doubtful teeth extracted. Drugs are not of any great value. Cod liver oil and syrupus ferri phosph. may be given, while the bowels should be kept regular by means of saline purges, if required. Sodium iodide has been given with success.

As regards local treatment, the joint should not be used too much, but, on the other hand, it must not be kept at rest; moderate exercise should be insisted upon, though this may be difficult on account of the pain.

Hot-air baths followed by massage, electric baths and ionization may do good.

Hæmophilia.—In persons suffering from this disease a trivial injury may result in a sudden effusion of blood into the joint. When this occurs the joint must be kept absolutely at rest, while ice-bags are applied to the part. The general treatment of the malady is given on page 104.

Neuropathic affections of joints (*Charcot's disease*) occur during the course of certain diseases of the central nervous system, notably *tabes dorsalis* and *syringomyelia*. Two varieties are described:—

In the *atrophic variety*, rapid erosion of the cartilage and bone takes place, associated usually with the rapid effusion of a large quantity of fluid into the joint.

In the *hypertrophic variety*, the fluid effusion is accompanied by hypertrophy of the bone and other structures in the joint. In both these types, no pain is experienced.

Diagnosis.—The absence of pain, the absence of the characteristic lipping of the cartilages, and the large quantity of fluid effused, combined with the physical signs of the underlying nervous disease, will suffice to differentiate between Charcot's disease and osteo-arthritis, the condition with which it is most likely to be confused.

Treatment.—This is merely directed towards the relief of symptoms. Very large effusions may require aspiration. In the atrophic variety, increased mobility of the joint is often tiresome to the patient; in such a case some relief may be obtained from the use of a suitable splint.

Diseases of the Temporomaxillary Articulation—

Acute Rheumatism sometimes occurs in this joint, giving rise to acute pain, slight effusion of fluid, and sometimes some fever.

Treatment.—The administration of sodium salicylate gr. xv three times a day is usually sufficient to deal with the condition. Subsequent adhesions and consequent ankylosis of the jaw (*q.v.*) may result.

Gonorrhœal Arthritis is rare in this joint. It should be treated as described under gonorrhœal arthritis generally.

Simple Traumatic Synovitis from exposure to cold or injury is rare.

Infective Arthritis is fairly common. It may arise from a penetrating wound; from extension from a local septic focus, *e.g.*, disease of the lower jaw, dental disease, middle ear disease, osteomyelitis of the temporal bone, &c.; or as part of a general pyæmia. In cases arising from middle ear disease, the infection spreads through the Glaserian fissure.

The treatment is the same as for infective arthritis elsewhere. There is a great tendency to ankylosis (*q.v.*).

Osteoarthritis is fairly common, and is very prone to result in ankylosis.

Tubercle, Syphilis, and **Charcot's disease** are very rare in this joint.

Ankylosis of the Jaw.—Any of these pathological conditions affecting the temporomaxillary articulation may result in union of the two bones which enter into the formation of the joint. This union is usually fibrous, but may be bony. The condition is known as *true ankylosis.*

The jaw may also be fixed by conditions involving the surrounding soft parts, *e.g.*, scars after burns or other injuries, or even actual formation of bone in the muscles (*myositis ossificans*). Fixation of the jaw in this way is known as false ankylosis. The temporomaxillary articulation is very prone to become ankylosed, hence the manifest importance of beginning passive movements, &c., as early as possible when treating disease of this joint. All adhesions should be broken down under an anæsthetic as soon as they form.

If actual fibrous ankylosis has occurred, an attempt may be made to break down the union by force under an anæsthetic, a gag being subsequently inserted to avoid reunion. In spite of this precaution, there may still be recurrence of the ankylosis. The condyle of the lower jaw should then be excised.

Spasmodic Closure of the Jaws: Trismus.—This is due to spasmodic contraction of the masseters resulting from hysteria or from some local focus of irritation.

The chief local irritative causes of trismus are:—

(1) A malplaced, malerupting lower wisdom tooth, especially when butting into the second molar, and exposing its nerve.

(2) Any condition which may cause a lower wisdom tooth to press on the inferior dental nerve, *e.g.*, an abscess at the root of the tooth. It should be noted that the inferior dental nerve is normally closer to the third than to the second molar; it often grooves, and sometimes even perforates the roots of the third molar.

and is consequently very liable to be affected by disease of this tooth.

(3) Disease of the neighbouring bone or glands.

(4) Odontomes.

The condition has been mentioned in discussing the differential diagnosis of tetanus.

Treatment.—First remove the cause of irritation; when this has been done, massage of the masseter and passive movements of the jaw should be employed. Even though the jaw be firmly closed, it is quite possible to extract the lower wisdom tooth with a curved elevator, without opening the mouth.

CHAPTER XX.

SPECIAL INJURIES OF FACE AND NECK.

Scalp.—An injury to the scalp, which causes effusion of blood, but does not break the skin, results in a *hæmatoma* or blood tumour. A hæmatoma may be situated in one of three positions:—

(1) Between the skin and the occipitofrontalis muscle or aponeurosis.

(2) Between the occipitofrontalis and the pericranium.

(3) Between the pericranium and the bone.

In the first variety, the effusion of blood is limited in extent by the density of the subcutaneous tissue, and does not spread far. If treated like an ordinary bruise, with lotio plumbi and ice it soon disappears.

In the second variety, the effusion is only limited by the attachments of the occipitofrontalis muscle. The blood therefore may, and often does, spread over this whole area. The possibility of a fracture of the skull being present in addition to the hæmatoma must not be overlooked.

Treatment should include the application of an ice-bag to limit the effusion; if the blood is slow in absorbing, an elastic bandage may be applied.

The third variety of hæmatoma occurs most usually as the result of an injury during delivery. It is very likely to be mistaken for a depressed fracture of the skull, on account of the hard ridge of coagulated blood surrounding a softish centre which it presents. Careful examination will show that there is no real depression of the bone.

It should be treated in the same way as the other varieties.

Injuries of the scalp in which the skin is broken do not differ materially from wounds elsewhere; the danger of sepsis is somewhat increased, if the wound penetrates below the epicranial aponeurosis. The hæmorrhage caused by such an injury is usually successfully treated by pressure applied by means of a

ressing and bandage, stitches being inserted if equired. If either the temporal or occipital arteries e wounded the artery should be completely cut rough if the wound be only partial, and the bleeding nd seized in artery forceps and twisted. If this fails o stop the hæmorrhage a ligature should be applied.

Great care should be taken to avoid any infection of ne wound. The neighbourhood of the injury should e carefully shaved, purified, and dressed aseptically.

If infection occurs in spite of these precautions, a evere cellulitis may result, which is very liable to pread to the meninges. Free incisions should be nade at once, the pus evacuated, and fomentations pplied. *Surgical emphysema*—that is to say, an ccumulation of air beneath the skin—may arise from ne involvement of one of the air sinuses of the skull n a fracture. Fractures of the skull are dealt with in Chapter XVI.

Wounds of the neck are of special interest on account f the important structures liable to injury. Injuries f the neck are more commonly intentional than ccidental. An attempt to commit suicide by cutting he throat rarely results in injury to the large vessels, hese structures being more difficult to wound than night be supposed. If a large vessel, such as the arotid artery, is wounded, the hæmorrhage is, as a ule, so severe that death ensues before surgical aid an be obtained.

In most cases, however, the cut passes between the yoid bone and the thyroid cartilage, the resulting æmorrhage being mostly venous. The arteries most requently injured are the superior thyroid and the ngual. These arteries may require to be ligatured, ut the venous hæmorrhage will usually cease spon-aneously from the contact with cold air. The wound hould be treated on general lines. (*See* Chapters VI nd VII.)

The following are the more important *complications* hich may occur:—

The *base of the epiglottis* may be divided, and cause bstruction to respiration by falling backwards.

If the wound is lower down, the *larynx* or *trachea* ay be injured; respiration may again be impeded by he entrance of blood into the air passages.

The *pharynx* or *œsophagus* may also be wounded an injury of this nature will necessitate great care i the subsequent feeding of the patient. At first, it wi be wise to give nourishment per rectum, but patien suffering from cut-throat, especially if the injury h attempted suicide, are usually in a condition of sever shock, and require plenty of nourishment afterward As soon as possible, therefore, a stomach tube shou be passed in order that food may be given by th mouth, extreme care being used in the operation.

Later complications include *septic pneumonia* fro the inhalation of blood and septic matter through th wound; and *cellulitis of the neck;* both of which co ditions are very grave.

Treatment.—(1) If any *grave obstruction to respir tion* be present, it must be dealt with at once, at lea temporarily. It may be necessary to use a tracheoton tube, inserted either through the original wound, o through a separate incision made on purpose. Th choice of method will depend upon the particular ci cumstances obtaining in each individual case.

(2) *Arrest the hæmorrhage.*

(3) Treat the *shock and collapse*, which are ofte severe. In simple cases, where neither air passage nor alimentary tract are involved, the purification o the wound and the application of an aseptic or ant septic dressing will complete the treatment. Whe these important structures are wounded, operativ measures, the details of which vary with each individu case, will be required.

Foreign Bodies in the Air Passages.—A larg foreign body, very frequently a bolus of food, w lodge at the entrance to the larynx, and may com pletely block the opening, preventing the entrance o air. The patient becomes cyanosed from asphyxia.

Treatment if it is to be of any value must be imm diate. First make an attempt to reach and dislodg the foreign body with the finger. Do not waste val able time over three or four attempts. You have on a very short time in which to save a human life, and you do not at once succeed in dislodging the foreig body with your finger, *laryngotomy* must be performe Place the patient flat on his back on the floor. Ru your finger rapidly *upwards* along the trachea in th

ddle line of the neck. The first prominence which is t is the *cricoid cartilage*. Just above this is a larger ominence, the *thyroid cartilage* or "Adam's apple." ne larynx is to be opened by piercing the *crico-yroid membrane*, that is to say, the space in between e two prominences mentioned. If no surgical knife at hand, use the cleanest and sharpest pocket knife ailable. Hold the knife in such a way that one finger sts on the flat of the knife, leaving not more than a uarter of an inch of the blade bare beyond the tip of e finger. This is to prevent the knife passing right rough the posterior laryngeal wall, and wounding the ructures lying behind. Plunge the knife transversely raight into the larynx, and turn the blade through right angle. Don't worry about the hæmorrhage. lhe veins, engorged with blood by the asphyxia, will eed profusely at first; but as soon as the larynx is pened, and the patient begins to breathe, the bleeding ill almost stop, and can be dealt with later. If a ryngotomy tube is at hand it should be inserted. If ot, the wound must be kept open by some other ieans. Two hairpins bent in the shape of hooks will orm a convenient means for holding the two sides of ne wound apart. Artificial respiration may still be equired to start the patient breathing.

Smaller articles, e.g., small artificial dentures, which re causing dyspnœa, but do not completely obstruct ne entrance of air, may be picked out with the aid of pecial forceps called *laryngeal forceps*. Small objects f this kind, which do not cause asphyxia by their own ize, may do so by inducing œdema of the glottis. In nese cases the symptoms are not of such great urgency s those described above. If the dyspnœa is urgent, aryngotomy or tracheotomy should be performed. (Tracheotomy is described on page 177.) A careful aryngeal examination should then be made, in case it hould be possible to reach the object with forceps. X-rays are often of great service in determining the osition of the obstruction. If it cannot be reached with forceps operative measures will be required for s removal. A very small object may pass right down nto a bronchus, and escape diagnosis altogether. The probable consequences of such a condition would be collapse of the corresponding lung, or septic bronchitis

and empyema. The right bronchus is wider and more vertical than the left, and consequently foreign bodies more frequently enter the right bronchus.

Foreign Bodies in the Œsophagus.—Many extraordinary objects have been swallowed, especially by children and lunatics. Under ordinary circumstances, fishbones, coins, marbles, artificial dentures, and obstructive boluses of food are among the most common foreign bodies which lodge in the œsophagus. If the object is a piece of food, and is capable of being pushed on into the stomach, this is the best treatment. Small articles which have reached the stomach, such as small coins, will probably be passed per rectum, and should be left to do so. When an object is impacted in the œsophagus, X-rays will give valuable aid in determining its position. Various ingenious instruments have been devised for removing foreign bodies from the œsophagus, of which the probang and the coin-catcher are examples. Such a thing as a denture, especially if armed with wires and bands, may be very difficult to remove without damaging the surrounding tissues. If necessary, operative measures must be employed.

CHAPTER XXI.

DISEASES OF THE MOUTH, LIPS, PALATE, TONSILS AND PHARYNX.

Catarrhal Stomatitis, or catarrhal inflammation of the buccal mucous membrane, resembles in its pathological features catarrhal inflammation in other mucous membranes (*vide* Chapter III). The condition may result from a variety of causes, of which the following are the most common:—

(1) Any local irritation, such as a roughened tooth or ill-fitting denture; certain irritant drugs, such as mercury (*vide* Mercurial Stomatitis), or the constant drinking of neat spirits; any septic condition present in the buccal cavity.

(2) Chronic gastro-intestinal disorders.

(3) The condition may occur during the course of an acute specific fever.

(4) Pneumococcal infection. This latter cause is rare, but a few quite definite cases have been demonstrated.

Whatever be the cause of the condition, it is characterized by hyperæmia and swelling of the mucous membrane; the inflammation is, as a rule, patchy at first, and gradually spreads over larger areas, until in some cases the whole of the mucous membrane of the mouth is involved. It is accompanied by the smarting, gritty feeling so characteristic of all catarrhal inflammations.

Treatment.—First treat the cause of the condition, whether it be a badly-fitting crown, a chronic gastritis, or an over-indulgence in whisky without the soda.

For many years it has been the custom to prescribe potassium chlorate as a specific for stomatitis. Recently, however, some doubts have been cast upon its efficacy. Potassium chlorate may be given either as a mouth-wash, gr. xxv ad. ℥i of water, to be diluted before use with an equal quantity of hot water, or in the form of lozenges (gr. iii B.P.). Formamint

lozenges are also advised in this condition, and as in the great majority of cases infection by micro-organisms is an important etiological factor, the bactericidal action of the formalin contained in the formamint is of value. Care should be exercised in prescribing formamint in those cases where a chronic condition in the gastro-intestinal tract is present; formalin is very irritating to some gastric mucous membranes, and the treatment must be stopped at the first sign of ill-effects in the stomach.

In severer cases, a mouth-wash of liq. sodæ chlorinatæ ʒi ad. ʒi, or hydrogen peroxide, may be given.

Ulcerative Stomatitis usually occurs as a later stage of an untreated catarrhal inflammation. The clinical picture is similar, the pain being more severe, and the mucous membrane being ulcerated. It should be treated on similar lines to the catarrhal variety.

In cases due to infection by the *pneumococcus*, there is usually considerable ulceration, and destruction of gum. The treatment of these cases is very tedious. Bacteriological treatment has met with little or no success. In a case which came under the author's notice, the patient (a child of about 10, in whom the gum around the six lower incisors was chiefly affected) was treated first with silver nitrate solution, and later the gums were regularly painted with tincture of iodine. Progress was slow, but ultimately cure resulted. This patient had previously been treated with vaccines without success.

Aphthous Stomatitis is a condition characterized by the presence of exquisitely painful, minute, white spots on the buccal mucous membrane. They should be treated by cauterization with copper sulphate or solid silver nitrate. Attention should also be paid to the gastro-intestinal tract, upon some chronic condition of which aphthous stomatitis frequently depends.

Mercurial Stomatitis is described in a separate paragraph because it is such a common condition. But it actually consists of a severe catarrhal stomatitis, rapidly progressing to ulceration. As its name implies, the condition results from the prolonged use of mercury. By far the most common malady in which the prolonged use of mercury is advised is syphilis,

and, consequently, severe stomatitis is often found in patients suffering from syphilis. A special form of stomatitis, known as syphilitic stomatitis, is described, but it seems highly probable that this condition is due, not to the syphilis, but to the mercury prescribed to cure it; and that it should therefore be classed as mercurial stomatitis. As mentioned above, the disease begins as a simple catarrhal inflammation, the mucous membrane being red and inflamed, and the salivary secretion being markedly increased. There is usually considerable pain, and a metallic taste in the mouth. The condition progresses rapidly, the gums becoming very painful, soft, ulcerated and readily bleeding. The breath is offensive and the teeth tend to become loose.

The treatment consists in withholding the mercury, and employing the methods of local treatment advised for the ulcerative variety.

Gangrenous Stomatitis is a severe condition resulting from:—

(1) Septic infection of ulcerative stomatitis.

(2) As a complication of acute specific fevers, especially in measles, in debilitated children in that section of the community in which oral hygiene is not practised.

(3) In old people suffering from chronic debilitating diseases, such as diabetes or chronic Bright's disease, combined with oral sepsis.

(4) In neglected mercurial stomatitis.

As its name suggests, the condition results in considerable destruction of the tissues of the gums, lips and cheeks. Necrosis of the jaws may also occur.

In children, this condition is known as *Cancrum oris* (*see* Chapter V), and is an extremely fatal malady, occurring as it does in patients whose resisting power is already undermined by poverty, starvation and dirt. A similar condition attacks the vulva, and is known as *Noma vulvæ*.

Treatment (*see* Cancrum oris, Chapter V).

Thrush is a condition occurring chiefly in underfed and dirty children, and is due to the presence of a parasitic fungus, *Oidium albicans*. White patches appear on the buccal mucous membrane, most commonly inside the cheeks. The patches resemble spots of milk. They are difficult to describe accurately, but,

when once seen, are very easy to recognize. The student should embrace every opportunity of inspecting the patches for himself.

Treatment.—The general condition must first be treated; the mouth must be kept clean as far as possible, special cleanliness being insisted upon in regard to drinking and feeding vessels. The patches themselves should be painted with glycerine of borax.

Salivary Calculus is described in detail in text-books on dental surgery.

Cysts of the Floor of the Mouth—

A **Ranula** is a cystic swelling in the floor of the mouth connected with one of the glands in the neighbourhood, or their ducts. A ranula usually appears as a unilateral cystic swelling, often as large as a walnut, and sometimes larger, containing thick, mucous fluid. When quite small, *e.g.*, the size of a pea, these cysts are often termed *mucous cysts*.

Treatment consists in dissecting out as much of the cyst wall as possible. Any of the cyst wall which cannot be removed should be cauterized with pure carbolic acid.

Dermoid Cysts also occur in the floor of the mouth. They differ from ranulæ in being more common in the middle line, while ranulæ are almost invariably on one side; and also in containing cheesy, sebaceous material.

Treatment is similar to that advised for ranulæ.

Syphilis.—*Primary Chancres* (*vide* Chapter XII) occur on the lip, which is perhaps the commonest position for an extragenital chancre. The usual characters of a hard chancre are present, and the submaxillary lymphatic glands are enlarged. The diagnosis of this condition from those with which it is most likely to be confused, namely epithelioma, gumma and tubercle, is treated in a little detail in the chapter on Diseases of the Tongue (Chapter XXII).

Mucous patches frequently occur in the mouth, and are extremely contagious (*vide* Chapter XII).

Gummata also occur.

The treatment of syphilis, when it affects the mouth, differs in no way from the treatment of the disease in other situations.

Tuberculous Ulceration is not common.

Carcinoma occurs most commonly as an epithelioma. It is more frequent in the lower than the upper lip. The signs and treatment of this condition are described in dealing with epithelioma of the tongue (Chapter XXII).

Herpes labialis is a vesicular eruption which affects a small area on the lip. It is often somewhat painful. It occurs during the course of such maladies as a common cold, influenza, pneumonia, cerebro-spinal meningitis, and other conditions. It must not be confused with Herpes Zoster, which is described in Chapter IX. *Local treatment* is rarely required. The patch may be dusted with boracic powder if necessary.

Congenital Conditions—

Macrocheilia (*vide* Chapter X).

Hare-lip and Cleft-palate.—These two conditions are so intimately associated with one another that it will simplify matters to consider them together.

Hare-lip is a congenital condition in which imperfect development results in a cleft in the lip. The condition varies considerably in degree; it may involve the lip only; the cleft may run further upwards into the nostril, or the alveolus of the superior maxilla may be included in the deformity. It may be unilateral or bilateral, and may or may not be associated with cleft-palate.

Cleft-palate is a similar condition affecting the palate, resulting again from imperfect development. As in hare-lip, the extent of the cleft varies considerably, from a mere bifid uvula or a cleft soft palate to a cleft involving hard palate as well. In addition, hare-lip may or may not be present.

It will be necessary to the proper understanding of what follows that we should allude briefly to the developmental features.

The fronto-nasal process, passing downwards from above, divides into two processes each side, an internal and an external nasal process. From the sides of the head advance the two maxillary processes. These processes should all unite to form the upper part of the normal face. If for some reason they fail to unite, an abnormal cleft, either in lip or palate, or in both results.

Many battles have been fought over the question of the anatomical relations of the cleft. Until last year it was generally held that the cleft passed between the central and lateral teeth. But Professor Keith has recently shown several specimens in which the cleft passes actually through the socket of a tooth. Professor Keith's paper is of immense interest and scientific value, and will well repay careful study.

Treatment.—The treatment of these conditions is always operative, except perhaps in the case of a simple bifid uvula, which may not demand any treatment. The main question to be considered is when the operation is to be performed. It should be done as soon as the child's physical condition is such as to enable it to pass through the ordeal satisfactorily. In a healthy child the operation can usually be safely undertaken at from six weeks to three months after birth, according to the size of the child. Operation should be delayed if the child is weakly; and if any septic condition of the nose or mouth, such as snuffles, stomatitis, &c., is present, this should be dealt with before operation is attempted. Operative measures should always be completed when practicable before the commencement of teething.

Operation will require to be performed earlier than usual, if the child is suffering from an inability to suck due to the developmental defect. The details of the various operations, which are performed in the different degrees of the condition, appear most unpleasantly complicated in text-book descriptions, but become comparatively simple when the actual operation is seen. The student should, therefore, make a point of being present at the performance of these operations, when he will find them quite easy to understand, and by carefully watching the operator he will find his difficulty in grasping the details rapidly disappear.

The essential points in the *operation for hare-lip* are as follows:—

The buccal mucous membrane is cut through at the point where it is reflected from the lip to the labial surface of the superior maxilla, and the lip is freely dissected away from the maxilla. In a single hare-lip two crescentic incisions are now made, one on each side of the cleft, these incisions joining above

(fig. 15). The edges of the cleft are now pared along the lines of these incisions, the raw surfaces thus formed being subsequently drawn together and stitched by means of deep silver-wire stitches (two in number as a rule), and a varying number of horsehair or catgut stitches. The appearance at the end of the operation is shown in fig. 16). A collodion dressing is

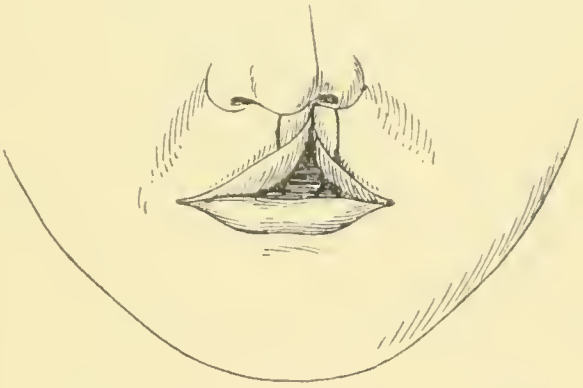


FIG. 15.—Hare-lip, shewing incisions.

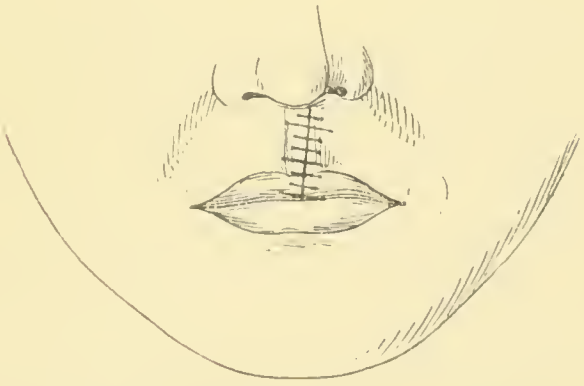


FIG. 16.—Hare-lip ; operation completed.

then applied. The silver-wire stitches are usually removed on the fourth day, and the horsehair stitches at the end of a week or ten days.

The details of the operation are subject to variations dependent upon the extent of the cleft, but the main essentials are the same.

The *operation* required for the restoration of a *cleft-palate* is briefly as follows:—

Two curved incisions are made in the mucous mem-

brane of the palate, one on either side of the cleft. These incisions should run parallel to the upper teeth, and about half an inch internal to their lingual surface. The length of the incisions will, of course, depend upon the extent of the cleft. The soft tissues internal to these incisions are then stripped off the bone, so that two flaps are obtained, consisting of all the soft tissues of the palate, these flaps remaining fixed at each end.

The edges of the cleft are then pared (in the same way as in the operation for hare-lip), brought together in the middle line, and secured by silver-wire stitches.

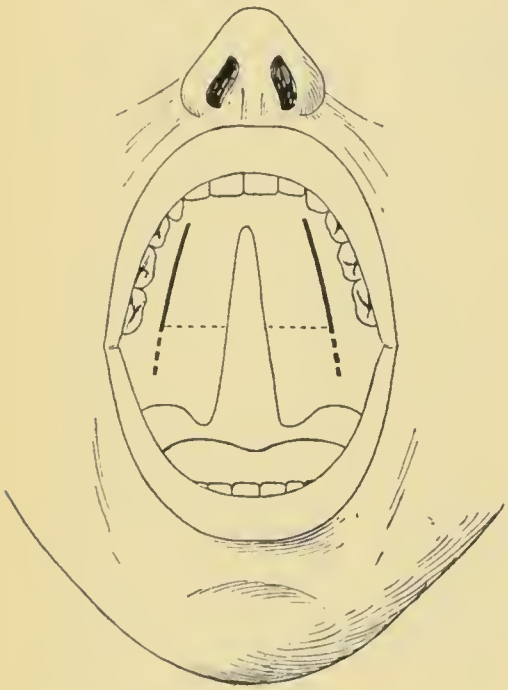


FIG. 17.—Cleft-palate; shewing incisions.

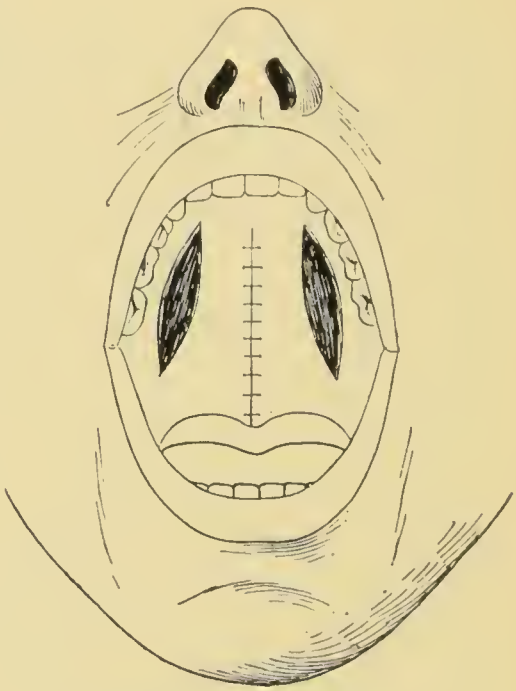


FIG. 18.—Cleft-palate; operation completed.

In order to avoid excessive tension on the stitches, the original incisions are prolonged backwards a short distance.

Acquired Perforations of the palate are almost invariably due to injury or tertiary syphilis, the latter being by far the most frequent cause. Tuberculous disease is rare.

Ulceration of the palate may occur as part of an ulcerative stomatitis. Most commonly it is syphilitic or malignant; more rarely it may be tuberculous.

Tumours of the palate.—Simple tumours are rare, the most common being fibromata.

Malignant tumours, both epitheliomatous and sarcomatous, occur, usually by extension from neighbouring tissues, such as the jaw or tonsils.

Tonsils—

Acute catarrhal tonsillitis occurs in association with pharyngitis as the ordinary "sore throat." It should be treated by the administration of potassium chlorate gargle. The possibility of a sore throat being the first sign of the onset of an acute specific fever, such as scarlet fever or diphtheria, should never be lost sight of, especially in children.

Acute follicular tonsillitis is an infective inflammation resulting in enlargement of the tonsils, accompanied by pain and redness of the tonsillar mucous membrane.

A membranous deposit occurs in patches on the tonsils. The membrane is *confined to the tonsils*, and the underlying tissues *do not bleed* when a piece of membrane is carefully pulled off. These are two important points of difference in the diagnosis between this condition and diphtheria (*q.v.*). The temperature is usually high (*e.g.*, 103° or 104° F.), which is higher than is usual in diphtheria. The cervical glands are often enlarged. The condition may usually be distinguished from *scarlet fever* by the absence of the typical "strawberry tongue" and characteristic rash, and also the fact that the membrane is confined to the tonsils.

Treatment.—The patient should be confined to bed, and a smart purge administered. A glycerine of belladonna fomentation should be applied to the neck to relieve the pain, and a gargle of hydrogen peroxide or liq. sodæ chlor. given. Minim doses of tinct. aconiti may be useful if the fever is pronounced.

Quinsy.—This condition is often spoken of as acute suppurative tonsillitis, but it actually is a combination of acute tonsillitis and suppuration around the tonsil, *i.e.*, *peritonsillar abscess*. It should be treated in the same way as follicular tonsillitis in the early stages, but when a definite peritonsillar abscess is present this should be incised under cocaine and the pus evacuated.

Diphtheria is an acute specific disease due to the presence of the *Bacillus diphtheria*, or Klebs-Löffler

bacillus. The organism is slender and rod-shaped; it is Gram positive, but takes the stain somewhat irregularly. Several organisms very similar to the Klebs-Löffler bacillus exist, and a special method of staining (Neisser's method*) has to be employed in order to distinguish between them.

The disease is characterized by a local membranous deposit, accompanied by general constitutional symptoms. The membrane usually appears first upon the tonsils, fauces, and soft palate, whence it may spread to the nose or larynx. More rarely it is primary in the nose or larynx. In still rarer cases, diphtheritic membrane may form upon the skin in other parts of the body, usually upon some slight wound.

The incubation period of diphtheria is usually from two to four days. The disease reveals itself by general malaise, slight fever, not usually more than 101° F. (*cf.* tonsillitis), headache, and sore throat. At first, the membrane takes the form of whitish-yellow dots of deposit, which gradually coalesce and spread over larger areas. As the disease progresses the membrane becomes darker in colour, and thicker. However carefully it be pulled off, the underlying tissues bleed, and a raw surface is left, upon which the membrane reforms. The disease varies in severity from cases in which no membrane is present (the diagnosis depending upon bacteriological examination) to extremely severe cases where a black sloughing mass is seen in the throat and grave constitutional symptoms are present. Extreme dyspnœa may occur, so grave as to necessitate the immediate performance of *tracheotomy* or *intubation*. The former is described below. Intubation is an operation which consists of passing a special, flexible, metal tube down the trachea past the obstruction.

The chief *complications* are: *Otitis media* from direct extension, *cardiac failure*, and *acute nephritis*. Later on, *diphtheritic paralysis* may ensue, neither less frequently nor less severely in the mild than in the severe cases. The palate is most frequently affected, then the muscles of the eyes, and, least often, the limbs and other muscles.

* A combination of methylene blue and Bismarck brown, by which the irregular staining of the organisms is shewn.

The diagnosis is made from the points already mentioned, *i.e.*, the appearance of the membrane, and the slight pyrexia. A bacteriological examination of a swab from the throat, if positive, settles the matter.

The treatment of diphtheria belongs more to the domain of medicine than surgery, and therefore is not discussed in detail here. The employment of *diphtheria antitoxin* has revolutionized the treatment, and has had a wonderful effect in reducing the death-rate from the disease.

Since the introduction of the antitoxin treatment, the necessity for the performance of *tracheotomy* is of much rarer occurrence. But the operation is necessary in certain cases, and therefore this is an appropriate moment for a brief description. Some of the other conditions in which the performance of tracheotomy may be required are: The removal of foreign bodies from the air passages; cases where there is pressure on the trachea (*e.g.*, from malignant disease of the thyroid), or cases of injury to the air passages.

The operation may be performed in three situations:—

(1) Above the isthmus of the thyroid: *High operation.*

(2) Through the isthmus of the thyroid: *Median operation.*

(3) Below the isthmus of the thyroid: *Low operation.*

The High operation is the easiest, and is, therefore, most frequently performed.

Place the patient, usually a child, on its back. The operator stands on the right side of the patient, and an assistant behind the patient's head. The duty of this assistant is to see that throughout the performance of the operation the patient's head is kept accurately in the middle line. If an anæsthetic is being given the anæsthetist should stand opposite the surgeon. Other assistants will be required to control the patient's movements.

The first step is to find the cricoid cartilage, and steady it with the left thumb and finger. The cricoid cartilage should be held thus until the completion of the operation. A median incision is then made

vertically downwards for about an inch and a half from the centre of the cricoid cartilage. The length of the incision will, of course, depend upon the age and size of the patient. The underlying tissues are then divided in the same line until the sternohyoid and sternothyroid muscles are exposed. The fascia connecting the muscles of the two sides together is divided with the handle of the knife. The surgeon now draws aside the muscles of each side with retractors. These retractors should be controlled by the assistant who is holding the head; the muscles must be retracted equally on both sides, so that the further incisions may still be made accurately in the middle line; the patient's head can still be controlled by the forearms of the assistant. By pulling the thyroid isthmus downwards with a retractor, the trachea will be exposed, and an incision should be made into it, in the middle line, the knife being held with the cutting edge turned upwards towards the cricoid cartilage, adopting the same precautions as recommended in the operation of laryngotomy (*see* p. 164), in order to avoid injury to the posterior tracheal wall, or important structures behind it.

As in laryngotomy, venous hæmorrhage is usually profuse, but it will generally cease as soon as the tracheal incision has been made. If serious bleeding occurs, a wise precaution is to apply four pairs of Spencer Wells' forceps, one at each end of the incision, on each side. One of the authors has seen a case in which high tracheotomy was being performed upon a baby with diphtheria; though profuse hæmorrhage occurred, the surgeon proceeded with the operation, trusting that the hæmorrhage would cease as soon as he penetrated the trachea. But, as a matter of fact, a large vein, probably one of the innominate veins in an abnormal position had been wounded, and death occurred in about a minute. An accident of this type is of quite rare occurrence, but the fact that it may occur should always be borne in mind. In this connection, we would impress upon the reader that these vital structures are, in the case of young children, crowded together in a surprisingly small space, and that our notions of their anatomical relations, learnt in the dissecting-room, will not serve us unless we

bear in mind the great difference in these relations in infancy.

When the trachea has been opened, tracheal dilators are passed into it. The metal tracheotomy tube must then be inserted. In diphtheria, it is wise to hold open the trachea with the dilators until all loose membrane has been coughed up, before inserting the tube. The tube is then secured by tapes, attached to it on each side, and tied round the neck.

The Low operation is much more difficult, on account of the greater depth of the trachea, the closer proximity of the large venous trunks, and the possible presence of the occasional throidea ima artery. If the obstruction to respiration necessitating operation is low down, the Low operation may be necessary, but apart from considerations of that kind, it is rarely chosen. The steps are similar to those of the High operation.

The Median operation is rarely performed. In the hands of an expert it is, perhaps, quicker than the high operation. The incision is made right through the isthmus, dividing it completely. The hæmorrhage from the isthmus can be disregarded until the dilators have been inserted into the trachea.

Chronic Enlargement of the Tonsils is a common condition in children, especially weakly, strumous children; it is very commonly associated with the presence of adenoids (*q.v.*).

Treatment consists in removal of the enlarged tonsils, combined with general hygienic measures and the administration of tonics, such as cod-liver oil, &c.

There are two methods of removing enlarged tonsils:—

(1) With an instrument known as a *Guillotine*, by means of which the superficial two-thirds, more or less, can be removed.

(2) By *enucleation*, that is to say, dissecting out the whole tonsil.

Syphilis may affect the tonsil, either in the form of secondary ulceration, or gummata.

Sarcoma and **Carcinoma** may both affect the tonsil. The operation for the removal of a malignant growth in this region is extremely difficult and extensive, and the disease is very liable to recur.

Diseases of the Pharynx.

Adenoids are small, lymphoid growths at the back of the nose, which are commonly associated with chronic tonsillar enlargement. Their presence has considerable effect upon the development of the jaws, for a description of which a text-book on dental surgery should be consulted. The treatment is to remove the growths.

Acute Pharyngitis is generally associated with acute catarrhal tonsillitis (*q.v.*) and requires similar treatment.

Chronic Pharyngitis occurs as the result of overuse or misuse of the voice (the so-called *clergyman's sore throat*), or some chronic irritation, such as constant cigarette smoking or spirit drinking.

The symptoms of the disease are hoarseness, tiredness, and loss of voice, and a dry cough. On examination, the follicles will be seen to be enlarged. Excessive cigarette smoking results in a dullish red appearance of the pharyngeal mucous membrane, mottled with white spots, which is very characteristic.

Treatment.—First remove the cause of the disease. The pharynx may then be painted with glycerine of tannic acid, or an ammonium chloride inhaler may be used.* When the follicles are much enlarged, they may be touched with the electrocautery under cocaine anæsthesia.

Syphilis commonly affects the pharynx. In the secondary stage, pharyngitis, mucous tubercles, and ulceration occur.

In the tertiary stages, gummata may involve the pharynx.

Carcinoma and **Sarcoma** may occur in the pharynx. As was mentioned in dealing with malignant disease of the tonsil, the operative treatment of these growths is very extensive and difficult.

Retropharyngeal Abscess may be acute or chronic. The acute cases usually result from infection following pharyngitis in children. The condition is a grave one, as the pus may burrow in various directions, and is

* A complicated apparatus, in which by the interaction of hydrochloric acid and ammonia, ammonium chloride vapour is given off, and inhaled through a tube.

difficult to evacuate completely. Considerable constitutional disturbance generally accompanies the condition, while dysphagia and dyspnœa may result from the local swelling.

Treatment consists in immediate operation to evacuate the pus.

Chronic cases are almost always the result of tuberculous disease of the cervical spine (*q.v.*).

CHAPTER XXII.

DISEASES OF THE TONGUE.

Tongue-tie is a congenital condition in which the frenum is abnormally short, and its attachment may extend forward so as to approach very closely the necks of the lower incisors. In most cases, the frenum lengthens as the child grows, and no treatment is required. If the defect interferes with the child's ability to suck, the frenum must be snipped through. It should be cut transversely, close to the symphysis. The tongue should then be pulled forward, so that the transverse slit is stretched into a longitudinal one, and the sides of the wound drawn together and stitched. This procedure is adopted in order to avoid the scarring which takes place if the frenum be just carelessly snipped through and left; in cases so treated the condition after operation becomes frequently worse than it was before.

Wounds of the Tongue.—The commonest accident to the tongue is a bite, either from a fall with the tongue between the teeth, or during an epileptic fit. In epilepsy, during the fit, a pencil or a cork should be placed between the teeth to prevent this accident.

Hæmorrhage from a bitten tongue is rarely severe. It can usually be controlled by giving the patient ice to suck. If an artery can be seen spirting, it should be seized with artery forceps and ligatured. If necessary, one or more stitches may be inserted in the wound. In very severe cases, it may be necessary to ligature the lingual artery through an incision in the neck.

To expose the lingual artery in the submaxillary triangle of the neck, two points are taken, one an inch below and external to the point of the chin, and the other just above and behind the angle of the lower jaw. A crescentic incision is then made joining these two points (fig. 19).

The after-treatment of a wound of the tongue consists chiefly in cleanliness. Liquid food should be given, and the mouth should be carefully and frequently washed out with weak boracic or peroxide lotion, especially after meals.

Burns, *Scalds*, and *Stings* of insects may be dangerous, on account of the swelling of the tongue, and consequent dyspnœa which may result. Ice should be given to suck; if there is much swelling, superficial incisions may be made in the tongue. In very urgent cases, laryngotomy may be required. For insect stings, solid bicarbonate of soda is a good local application, on account of its action in neutralizing the acid injected by the insect.



FIG. 19.—Incision for ligature of the lingual artery in the neck. (The dotted line indicates the lower margin of the mandible.)

Acute Inflammation of the Tongue (acute parenchymatous glossitis) is an uncommon condition. It may occur as the result of mercurial treatment, or follow a septic wound or an insect sting. The tongue is swollen, painful, and inflamed, and the salivary glands may be enlarged.

Treatment.—In mercurial cases, the administration of the drug should be discontinued at once. The mouth should be frequently washed out with boracic or peroxide lotion. Potassium chlorate lozenges may

be given, and the bowels should be kept regular by means of saline purgatives. If an abscess forms, it should be opened at once.

Acute Superficial Glossitis occurs as part of a general acute stomatitis (*q.v.*).

Chronic Superficial Glossitis is a condition of considerable importance on account of the frequency with which, if untreated, it develops into epithelioma. It is of the greatest importance that the dental specialist should be fully aware of the gravity of the condition and be prepared to recognize its presence, as a timely diagnosis on his part may constrain the patient to seek surgical advice at a period in the disease when appropriate treatment will effect a cure.

The condition occurs more frequently in men than women, usually after 40 years of age. It may be the result of any chronic irritation, of which excessive smoking, especially when a broken clay pipe is used; roughened teeth; ill-fitting crowns and dentures; and spirit drinking, especially when neat spirits are taken constantly, are common examples. It may also be due to syphilis.

Several stages of the malady are described, each stage running imperceptibly into the succeeding one. At first, hyperæmic patches, due to enlarged papillæ, occur. These patches are best seen after pressing blotting paper on the tongue to dry off the moisture. Later on, raised white patches make their appearance. These patches consist of opaque and horny epithelium, heaped up on the surface. This stage is known as *Leukoplakia*. Still later, the epithelium is shed, leaving a smooth, red surface, upon which the papillæ are atrophied. Cracks, fissures, and even ulceration frequently occur.

The condition is generally accompanied by considerable pain and tenderness, with consequent difficulty in speech. Hot or irritating substances, such as mustard or strong spirits, cause pain.

Treatment.—All possible sources of irritation must be removed. The teeth must be scaled, all carious cavities treated and sharp points smoothed down, and any unsatisfactory mechanical apparatus readjusted. Smoking should be forbidden, as also should spirits and irritating food. The mouth should be kept clean by

means of mouth-washes, which must not be irritating in character. Sodium bicarbonate gr. xx ad. ʒi is a useful mouth-wash. Formalin is too irritating and should not be prescribed for this condition. Caustics should not be used, on account of the danger of epithelioma. If syphilis is the suspected cause, anti-syphilitic remedies should be prescribed, but careful watch must be kept for any signs of mercurial stomatitis, the occurrence which is specially likely under these circumstances. The patient must be seen at frequent intervals in order to watch for and detect the earliest signs of epithelioma.

Ulceration of the Tongue.

A simple traumatic ulcer may result from any of the local irritations mentioned above. These ulcers are very painful. The first essential in the treatment is to remove the cause. The mouth should be kept clean by means of mouth-washes. The base of the ulcer may be cauterized with 2 per cent. chromic acid, under cocaine anæsthesia. Orthoform dusted over the ulcer will often relieve the pain considerably.

Simple ulcers of the tongue are sometimes associated with dyspepsia and other chronic gastro-intestinal disorders. In these cases, the underlying cause must, of course, be dealt with.

Ulceration of the tongue also occurs as part of a mercurial stomatitis (*q.v.*).

Syphilis—

Primary Chancres of the tongue are not common. When they occur, they have the usual characteristics of a hard chancre; the tip of the tongue is the most usual position. (For differential diagnosis, *see* p. 187.)

Mucous patches are common in the secondary stage. In the tertiary stage, chronic superficial glossitis may occur (*q.v.*), or gummata may be formed.

Gummata of the tongue may be single or multiple. They are usually situated near the middle line, towards the posterior part of the organ. In the early stages, a gumma forms a firm swelling which may be superficial or deep. Later, it softens, breaks down, and ulcerates. The typical gummatous ulcer of the tongue

is oval and deep, with a sloughy base; the edges are not indurated nor raised, but usually undermined. There is no induration of the base of the ulcer, nor is there any interference with the movements of the organ. The glands are not often affected. Gummatous ulcers are comparatively painless. They should be treated with antisyphilitic remedies.

Tuberculous ulceration of the tongue is a rare condition, and almost invariably associated with advanced tuberculous disease of the lungs or larynx. When these ulcers do involve the tongue, they present a very typical clinical picture. The presence on the tip or side of the tongue of a slow-growing but extremely painful ulcer with a pale surface and irregular edge, in a patient suffering from phthisis or tuberculous laryngitis, is in all human probability a tuberculous ulcer.

Treatment.—The surface of the ulcer should be scraped with a sharp spoon, under local or general anæsthesia, and cauterized with pure carbolic acid. If the local lesion is small and the disease in the lungs is not advanced, it may be possible to effect a cure by excising the ulcer.

Epithelioma is by no means a rare condition. It affects men more often than women, and follows conditions similar to those mentioned as causes of chronic superficial glossitis. Indeed, this latter condition is a frequent prelude to the development of malignant disease. The malady may start in any position, but is perhaps more common in the anterior than the posterior half of the organ. When the condition is preceded by chronic superficial glossitis, the epithelioma usually begins as a hard, warty growth situated in one of the fissures or cracks which characterize the chronic inflammation. As a rule, ulceration occurs early; the typical ulcer presenting an indurated base, with everted, indurated edges. The base of the ulcer is sloughy, and there is often much offensive discharge; the breath also may be particularly offensive. The growth soon infiltrates the neighbouring tissues, and an early diagnostic sign is the interference with the movements of the tongue resulting from its fixation to surrounding parts. These ulcers often cause little or no pain. Neigh-

bouring glands are soon involved. (For differential diagnosis, *see* p. 187.)

Treatment.—Complete extirpation of the growth, with all the neighbouring glands, gives the only chance of cure.

Sarcoma is rare.

Actinomycosis may affect the tongue (*see* Chapter XII).

The differential diagnosis of the various ulcers of the tongue is of great importance. In typical cases it presents no great difficulty, but in the early stages microscopic examination of a portion of the tissue involved may be necessary before a diagnosis can be made. The following table may be useful:—

Simple ulcer	Hard chancre	Gumma	Tubercle	Epithelioma
Very painful ...	Not painful ...	Rarely painful	Very painful	May or may not be painful
Heals rapidly under treatment	Heals rapidly under mercury	Improves with potassium iodide	Very slow in healing, even under treatment	Does not heal
Characters of simple ulcer (*q. v.*, Chapter IV).	Indolent surfaces, induration around. Not fixed	Sloughy base, undermined edges. Not fixed	Irregular shape. Pale surface. No induration. Not fixed	Very hard. Much induration. Edges everted. Offensive discharge. Fixed to surrounding tissues
Glands not affected	Glands enlarged and tender	Glands not affected	Glands rarely enlarged	Glands enlarged early, and very hard
May be multiple or single	Always single	Often multiple	Occasionally multiple, but if so, all close together	Very rarely multiple
		Evidences of previous syphilis	Signs of tuberculous disease in lungs or elsewhere	

CHAPTER XXIII.

DISEASES OF THE GUMS AND JAWS.

As the great majority of the affections embraced under this heading are dealt with in detail in text-books on Dental Surgery, it is only necessary briefly to touch upon them here.

Gingivitis, or inflammation of the gums, generally occurs in association with stomatitis (*q.v.*), and is dependent upon similar causes. These causes are chiefly connected with the teeth, *e.g.*, tartar, pressure from an ill-fitting denture, or any condition which involves want of cleanliness in the oral cavity. Other causes include the action of certain drugs, notably mercury and phosphorus; certain gastro-intestinal disorders grouped together under the somewhat vague title of "indigestion"; certain specific affections, such as syphilis, tubercle and actinomycosis; and many general conditions, *e.g.*, scurvy, chronic renal disease, &c. In its early stages the disease is characterized by a condition of *hyperæmia*, the gums being soft and congested, and readily bleeding on pressure. *Ulceration* may occur, and if neglected the bone may become involved, and *necrosis* result.

Treatment.—The first essential is to remove the cause. An astringent mouth-wash should be prescribed, containing such drugs as alum, myrrh, or krameria, in some such proportions as the following:—

℞ Tr. krameriæ	...	...	...	℥i.
Tr. myrrh. ...	...	...	...	℥ss.
Tr. pyrethri ...	...	...	...	℥ss.
Alum ...	...	...	...	℥ss.
Thymol ...	...	...	...	gr. i.
Saccharin ...	...	...	...	gr. vi.
Sod. bicarb. ...	...	...	...	gr. iv.
Eau de Cologne	...	...	...	℥ii.
Spir. vini rect.	...	...	...	ad. ℥viii.

Fiat coll.

Sig.: A teaspoonful to be added to a wine-glassful of water, and used as a mouth-wash.

As in stomatitis, potassium chlorate has been regarded as a specific, and is still so regarded by some, though its efficacy is denied by others.

A smart purge should be administered at the outset, and regularity of the bowels ensured by salines throughout the treatment.

Pyorrhœa Alveolaris.—For a description of this condition a dental text-book should be consulted.

Many general disorders may trace their origin to this condition, among which may be specially mentioned any septic condition of the gastro-intestinal tract. The respiratory tract may be affected, or general septic intoxication may follow. This subject is carefully discussed in the last edition of Colyer's "Dental Surgery and Pathology," chap. xxv.

Diseases of the bones of the jaws have the same general characteristics as were described in dealing with the diseases of bone generally. (*See* Chapter XVII.)

Acute osteomyelitis is most common in children, and generally arises in connection with a tooth. The inflammation is often very severe, and extensive necrosis may result. The condition is more frequent in the lower than the upper jaw.

Treatment.—The offending tooth should be first removed. Trismus is a not infrequent complication which renders the operation of extraction difficult in the hands of any but an expert extractor. Free exit must be given for the pus, an opening on the outside of the cheek being made if necessary. If necrosis occurs, the removal of the resulting sequestrum will be required later.

Syphilis, Tubercle, and Actinomycosis all rank among the rare affections of the jaws. When they occur, they should be treated on general lines (*see* Chapter XII). The recent suggestion with regard to the possible connection between phosphorus necrosis and tuberculosis is mentioned below.

Phosphorus Necrosis (Phossy Jaw) is a condition produced by the action upon the system of *yellow phosphorus*. Red phosphorus is not poisonous.

The disease was quite a common occurrence in match factories in the days when yellow phosphorus was employed in this industry. Since the introduction

of the harmless red phosphorus in place of the poisonous yellow variety, it has become a comparatively rare disease. It commences with ulceration of the gums, which rapidly spreads to the periosteum and bone, the lower jaw being most frequently affected. The gum is separated from the bone, the pus burrowing its way underneath the periosteum and raising it up; the bone, robbed of its periosteum, undergoes necrosis.

It has been suggested recently that the disease above described is really a tuberculous osteomyelitis, the phosphorus merely acting as a predisposing cause.

Treatment. — Prophylactic treatment is of the greatest importance, and the main feature in the prophylaxis is the use of red phosphorus instead of yellow.

Persons whose work brings them constantly in contact with phosphorus should be submitted to frequent medical and dental inspection; and at the first sign of stomatitis or gingivitis the patient must discontinue his work with this substance, and the stomatitis be treated with hydrogen peroxide. When the disease has already commenced, contact with phosphorus must be at once discontinued. In this particular malady, the separation of the sequestrum is a very slow process, and it is therefore wise to excise the diseased portion of bone at once, without waiting for the sequestrum to separate naturally. If the periosteum and outer layer of bone are healthy, as is sometimes the case, an endeavour should be made to preserve them; where this is possible, new bone is subsequently laid down, and often quite an efficient mandible results.

Simple Hypertrophy of the Gums is a condition very variable in extent. It most commonly occurs in children as a sessile overgrowth of the gum between and around the teeth.

Slight cases may be treated by cauterization with glacial acetic acid, while the more severe varieties will require excision.

Odontomata —Tumours or cysts connected with the teeth are known as odontomes, and are of various kinds. Many classifications have been put forward, but the following will be found to satisfy all requirements: —

A Follicular Odontome, or **Dentigerous Cyst,** is a cyst which develops around a tooth, usually one

of the permanent series, especially in the molar region. The tooth follicle becomes expanded to a variable extent, the thickness of its wall varying from paper thickness to a quarter of an inch or so, according to the amount of expansion which takes place. The cyst thus formed is unilocular, and contains thick fluid. It also contains a tooth which is in some cases fully formed, while in other cases is so ill-developed as to be difficult to recognize. The cyst appears as a smooth, rounded tumour, which is of slow growth, and painless. The actual cause of the condition is not yet fully understood. Hopewell-Smith failed to find Nasmyth's membrane around teeth contained in follicular odontomes, and on this account has suggested that the stellate reticulum has degenerated and liquefied to form the fluid content of the cyst. In rare cases, several teeth are present in the cyst, which is then termed a *compound follicular odontome*.

The diagnosis of a dentigerous from a dental cyst is made chiefly upon the absence of one of the permanent teeth. A skiagram may reveal the tooth inside the cyst.

Treatment.—An incision should be made into the cyst, of sufficient size to allow of the removal of the enclosed tooth. The lining wall should be well scraped and cauterized with pure carbolic acid. The cavity thus revealed should be packed with sterilized gauze to insure healing from the bottom. The gauze dressing must be frequently changed, and the cavity irrigated with hydrogen peroxide.

An Epithelial Odontome, or **Fibrocystic Disease of the Jaw,** is a condition more frequently found in the mandible than the superior maxilla. The etiology has not been definitely settled; it probably arises either in connection with the enamel organ, or the mucous membrane of the gum.

Many cysts are present, containing a brownish mucoid material, and separated from one another by thin fibrous septa. In some cases, these septa may undergo subsequent ossification. The collection of cysts results in the formation of a tumour which is often of great size, and may be difficult to distinguish from myeloid sarcoma in the early stages. After a time, an epithelial odontome may become malignant in character.

The treatment consists in excision of the portion of the jaw involved by the growth.

A Fibrous Odontome results from a fibrous thickening of the tooth sac, from which the tooth never emerges. In appearance, the resulting tumour resembles a fibroma. It is rare in man, but fairly common in the lower animals, especially in goats. When occurring in man, it should be removed.

A Cementoma is also a condition rare in man, but fairly common in horses. The tooth becomes embedded in a mass of cementum, which may attain considerable size. The tumour should be removed.

A Radicular Odontome is a tumour attached to the root of a tooth. It makes its appearance after the crown is formed, but during the formation of the root. It consists, therefore, of dentine and cementum, but not enamel. Unlike other odontomata, it often causes considerable pain.

Treatment consists in extraction of the tooth with the attached growth.

A Composite Odontome is a tumour formed from all the elements of a tooth germ. It frequently first attracts attention at about twenty years of age, forming a hard tumour, often of considerable size. The maxillary antrum is frequently involved in the growth. Occasionally suppuration occurs.

Treatment.—The tumour should be removed.

A Dental Cyst is formed in connection with a diseased tooth, which is almost invariably dead. It is a unilocular cyst, lined with epithelium. It does not contain a tooth. Clinically, it closely resembles a dentigerous cyst; the two conditions are frequently mistaken for one another, until operative treatment reveals the true nature of the tumour.

Treatment.—The cyst should be opened, the epithelial lining scraped, and cauterized with pure carbolic, and the cavity of the cyst packed with sterilized gauze, the dressing being frequently changed.

Epulis is a tumour arising from the alveolar periosteum or the periodontal membrane. It may be simple or malignant.

A simple epulis is a fibroma, frequently associated with a diseased tooth. It forms a somewhat hard, pink tumour, with a smooth, or sometimes slightly

irregular surface. A tumour of this type, which has been present for some time, may undergo ulceration.

Treatment.—The growth should be removed. In most cases it is necessary to remove part of the bone of the jaw with the tumour, but the jaw rarely needs to be cut right through.

Malignant epulis is a term somewhat loosely used. Sometimes it is applied to all malignant tumours of the jaw, while in other cases it is used to mean a myeloid sarcoma (*q.v.*).

Carcinoma and **Sarcoma** both occur in the jaws, having the characteristics of malignant tumours generally. The diseases are treated by excision of the affected parts and the neighbouring glands.

Osteomata of the upper jaw have been described by some observers. It seems probable that these tumours were in reality composite odontomes.

Leontiasis Ossea is a very slow-growing, diffuse enlargement of the bone of the upper jaw. The cranial bones are also sometimes affected. It causes no symptoms except those due to pressure.

Treatment.—Where pressure symptoms occur, and the position of the tumour allows of operative interference, the growth should be chiselled away.

CHAPTER XXIV.

DISEASES OF THE NOSE.

Rhinitis denotes inflammation of the nasal mucous membrane, many varieties of which are described. Only a few of the more important ones can be dealt with here.

Acute Catarrhal Rhinitis is a condition commonly known as a *cold in the nose*. The nasal mucous membrane is affected by a catarrhal inflammation, which results in a watery nasal discharge, accompanied by the well-known symptoms, sneezing, headache, fever, &c. These symptoms, especially the fever, vary considerably in severity in different cases. Laryngitis or bronchitis are frequently present in addition, giving rise to further symptoms, of which cough is the most noticeable.

The disease is bacterial in origin; several varieties of organisms are present as a rule, among which *Micrococcus catarrhalis*, *Pneumococcus*, and *Bacillus influenzæ* may be mentioned as examples.

An unpleasant, but by no means rare, complication is the extension of the inflammation to one or more of the accessory sinuses, the frontal and ethmoid being most frequently involved. (*See* Chapter XXV.)

Treatment.—Every mother has her own infallible remedy for a cold. And as most colds will get well without treatment, the infallibility of the home-made nostrum is rarely called in question.

The chief point to be borne in mind in treating a cold is that it is an *infective disease*. Measures should therefore be directed towards the destruction of the micro-organisms. This may be achieved in various ways.

The patient's own power of resistance to the micro-organisms should be kept as strong as possible, all available means being taken to avoid any lowering of this resisting power. The patient should be kept in bed, and milk diet prescribed as long as the temperature is raised. The bowels must be regulated by suitable purgatives. Local means, such as spraying the nose with very weak formalin solution (*e.g.*, $\frac{1}{2}$ per

cent.) is strongly advocated by some. Formalin, however, is an irritating drug, and when applied to an already inflamed mucous membrane, sometimes does more harm to the tissues than to the bacteria.

Another way of giving the drug is in the form of formamint lozenges. Certain drugs are credited with a specific action in these cases. Both sodium salicylate and aspirin in 20-gr. doses three times a day are certainly of value, while six grains of quinine at bedtime at the beginning of a cold will often cut short its career forthwith. If the cough is severe, Dover's powder gr. x may be given at bedtime. For a detailed description of this condition, a text-book on medicine should be consulted.

Acute Suppurative Rhinitis may occur in the course of an acute specific fever, *e.g.*, scarlet fever; by extension from an empyema of one of the accessory sinuses; or occasionally it may be gonorrhœal.

The nose should be frequently washed out with weak boracic acid lotion, and the nasal mucous membrane painted with silver nitrate solution gr. v ad ℥i.

Diphtheria may affect the nose. (*See* p. 175.)

Chronic Catarrhal Rhinitis usually results from a neglected acute attack. It is frequently associated with some chronic nasal obstruction, such as adenoids, enlarged tonsils, a deflected nasal septum, or hypertrophied inferior turbinate bone.

Clinically, it is characterized by the presence of a mucopurulent discharge, while the anterior end of the inferior turbinate looks soft, flabby and œdematous. Any previous nasal obstruction is aggravated by the condition.

Treatment.—The nose should be frequently washed out with an alkaline lotion, such as:—

℞ Sod. bicarb. ℥i.
Boracis ℥i.
Acid carbol. ♏ xx.
Aquam ad. ℥viii.
Fiat coll.
Sig.: To be diluted with an equal quantity of water and used as a nasal wash.

The anterior end of the inferior turbinate should be removed, if enlarged; and any adenoids or any deflections of the septum dealt with.

Chronic Hypertrophic Rhinitis.—In this disease the nasal mucous membrane and the turbinate bones are hypertrophied, and unduly pale in colour. The condition gives rise to a stuffed-up feeling in the nose, sneezing, and watery nasal discharge. The sense of smell is commonly impaired, while the blocking of the Eustachian tube by hypertrophied mucous membrane or by discharge often results in impairment of hearing also.

Treatment.—A warm alkaline lotion should be used to wash out the nose. This must be done constantly and carefully. If necessary, the mucous membrane may be cauterized with the actual cautery under cocaine, or the anterior end of the inferior turbinate may be removed. Smoking should be reduced to a minimum, and attempts made to improve the general health by purgation, tonics, exercise in the fresh air, &c.

Rhinitis Sicca is a condition in which there is a deficiency of nasal secretion; the mucous membrane is dull, red and dry, and covered with dried crusts. There is also some dryness of the throat, and frequently an irritating cough.

Constant washing out with warm alkaline lotions is the chief point in the treatment. A potassium chlorate gargle may also be given.

Chronic Atrophic Rhinitis, or **Ozæna,** as it is sometimes termed, is an extremely disgusting complaint in which atrophy of the nasal mucous membrane occurs, accompanied by a fœtid discharge, which forms large crusts of inspissated mucus.

One of the main features of the disease is an extremely offensive odour, quite characteristic to those familiar with it; the patient is entirely unaware of the presence of this unpleasant smell. The malady may be accompanied by a dry cough, slight headache, and sometimes slight epistaxis (*see* p. 197).

Treatment consists in thoroughly cleaning out the nasal passages. An alkaline lotion must be given, but the crusts require to be gently removed by means of dressing forceps. It will be necessary to persevere with this treatment for a considerable period.

Adenoids (*see* p. 180).

Nasal Polypi are soft, red, pedunculated growths, occurring in the nose. They are composed chiefly of

myxomatous tissue, and are frequently multiple. They depend upon disease of the underlying bone, usually the ethmoid bone.

The main symptoms they cause are nasal obstruction and increased mucous discharge.

Treatment.—The growths should be removed by means of a wire snare.

Lupus (*vide* p. 223).

Syphilis (*vide* p. 91).

Rodent ulcer (*vide* p. 222).

Malignant disease of the nose is uncommon apart from rodent ulcer. Sarcoma is rather more common than carcinoma.

Epistaxis, or nose bleeding, may result from local or general causes.

The most frequent local causes are:—Injury (*see* Fracture of base of skull, p. 123), foreign bodies in the nose, polypus, adenoids, chronic rhinitis, or ulceration from tubercle, syphilis, or malignant disease.

Some of the more important general diseases of which epistaxis may be a manifestation are: Diseases of the blood, *e.g.*, anæmia, purpura, or scurvy; increased blood-pressure, *e.g.*, in renal disease; obstruction to the return of blood to the heart, *e.g.*, in certain cardiac diseases, or in cirrhosis of the liver; or in hæmophilia. It also frequently occurs in boys for no apparent reason, and appears to have quite a beneficial effect upon their health.

Treatment.—It will be obvious that the treatment must depend very much upon the cause. In certain conditions the hæmorrhage may be beneficial, and should not be hastily controlled.

Epistaxis due to local causes is generally slight. The patient should *lie down on his back;* the worst possible treatment is to bend over a basin. The application of ice-cold water to the nape of the neck is often sufficient to stop the bleeding. If this measure fails, the meatus of the nose must be carefully examined by means of a nasal speculum and head mirror. A useful nasal speculum can be improvised out of a hairpin by bending the two ends sideways into hooks. It will very often be found on examination that the bleeding comes from the small artery to the septum. The bleeding spot will then be found about half an inch behind the anterior edge of the septal cartilage. The application

of cocaine, followed by the actual cautery, to this spot will at once stop the hæmorrhage. Solid silver nitrate will often prove equally successful.

Any of the causes mentioned above should be dealt with as far as possible, if present.

Severe epistaxis is not common, and is generally due to some general cause. Plugging the nostril with cottonwool soaked in 1 in 1000 adrenalin solution will usually stop it. Several mechanical devices for plugging the posterior nares have been used, but the epistaxis is rarely of sufficient severity to require such methods.

Foreign Bodies in the Nose.—Children often push things up their nose a little too far for them to reach. Subsequent efforts to dislodge the object with a pin or other handy instrument usually result in pushing it further up.

When the child is brought with a definite history of having pushed something up his nose the diagnosis is already made. But very often the child, from fear or some other reason, does not tell his parents what he has done. The foreign body then remains in the nose, and from the irritation of its continued presence a local inflammation results. The child, therefore, is often brought to be treated for discharge from the nose, without any hint of its cause being given. In this connection, it must be remembered that a *unilateral nasal discharge in a child is almost invariably due to the presence of a foreign body*.

The *treatment*, of course, is to remove the foreign body. This is by no means so simple as it sounds. The nose must be carefully examined with the aid of speculum and head mirror, and the position and shape of the object determined. No attempt must ever be made to seize the object with forceps and pull it out. This is a temptation difficult to resist, for it looks so easy. But the result almost always is that the object, especially a smooth, round thing, such as a marble, slips out of the forceps, and passes still further along the meatus, the difficulty of removal being thus considerably increased.

The best method to employ is to pass a hooked instrument up the nose *past* the foreign body, and then *draw it downwards*. By this means the removal is usually quite easily accomplished.

CHAPTER XXV.

DISEASES OF THE ACCESSORY SINUSES.

A CLEAR and precise knowledge of anatomy is an essential preparation to the study of surgery in all its branches; and the accessory air sinuses of the face are no exception to this rule. The maxillary and in less degree the frontal sinuses are more intimately connected with dental disease, and it is with the diseases of these cavities that this chapter chiefly deals.

Our knowledge of the normal anatomy of the maxillary sinus, known familiarly as "the antrum," has quite recently undergone considerable alteration, and it would be well for the student to render himself familiar with the revised views concerning the anatomical relations of the sinus which have been approved by modern scientific authorities.*

One important anatomical consideration which must never be lost sight of in dealing with disease of any of the air sinuses, is that the mucous membrane lining all these cavities, and also the meatus of the nose, is one continuous layer, which explains in some measure the readiness with which infection may spread from the nose to an air sinus, or from one sinus to another.

MAXILLARY SINUS (ANTRUM OF HIGHMORE).

Acute Catarrhal Inflammation occurs mostly as the result of nasal catarrh, and is frequently associated with a similar inflammation of one or more of the other air cells. In addition to the symptoms dependent on the nasal catarrh, the patient experiences a sense of fullness and dull pain in the region of the antrum. The pain is sometimes neuralgic in type, spreading along the branches of the fifth cranial nerve.

Severe pain over the eyes, localized at the supra-orbital notch, is a common symptom of antral mischief, and must not be thought to be pathognomonic of frontal sinus disease.

* Underwood, A. S. *Journ. of Anat. and Phys.*, 1910.

Treatment.—The nasal catarrh must be treated in the manner already described (p. 194). Local treatment consists in washing out the nose and applying a solution of cocaine and adrenalin around the opening from the antrum into the nose. This procedure helps to reduce the swelling of the mucous membrane, and allow free exit to fluid in the antrum. If necessary, the anterior end of the inferior turbinate must be removed. If no fluid comes out, a probe should be passed in through the opening. Fomentations may be applied externally. Antiphlogistine is a very useful application.

Acute Suppuration in the Maxillary Sinus (Acute Antral Empyema) frequently results from disease of the molar teeth, the frequency decreasing as you go forwards.

There is so much misunderstanding prevalent with regard to the liability of particular teeth to be involved in antral disease that it will be well to state the facts clearly once and for all. The third molar, or wisdom tooth, is *always* in intimate relation with the cavity; the second molar, first molar and second premolar, are associated in degree of frequency in the order named; the first premolar is rarely concerned with antral disturbance, the canine practically never, and the teeth in front of the canine only as pathological curiosities.

Antral empyema may also occur as a sequel of the acute catarrhal form, or of some septic condition in the throat, or may result from injury, *e.g.*, the extraction of a tooth with surgically dirty forceps.

The exact proportion of "throat" origins for empyema as compared with "tooth" origins cannot be stated dogmatically—experts differ.

In the opinion of the authors, the starting-point of the trouble is much more frequently the throat, and the pure "tooth" cases do not account for more, at a liberal estimate, than one-third.

Clinically, the condition resembles the catarrhal form, but is accompanied by a unilateral purulent nasal discharge. The pain is sometimes severe, with tenderness on pressure. There may be some fever.

Transillumination is a physical sign which is sometimes of great value, but, on the other hand, may be

quite misleading. A definite difference in the condition of the two sides, on transillumination, is very suggestive of the presence of pus in the antrum, but cannot be regarded as a certain sign.

Puncture of the antrum through the nose is very useful, as it serves both as an aid to diagnosis and a means of treating the condition if present. If on puncturing the antrum and washing it out pus is obtained, the diagnosis is rendered certain. If no pus is obtained in this way, antral empyema cannot be excluded, as there may exist in the antrum septa so placed that a collection of pus behind a septum is not reached by the exploring cannula.

Treatment.—In cases of dental origin, the offending tooth should be extracted. In acute cases cure often results from washing out the cavity intranasally through a cannula, as described above.

It will be necessary to perform this operation at least three or four times. If on the fourth occasion no pus is obtained, the disease may be said to be cured.

If this treatment should fail more radical measures must be adopted, as described in dealing with the chronic variety.

Chronic Antral Empyema usually follows the acute variety, but may be chronic from the first. It may be due to any of the causes from which the acute cases result.

The clinical aspect of chronic antral empyema is similar to the acute type. Definite signs of distension of the cavity may be made out; a tender swelling may be detected pressing outwards in the cheek, inwards in the nose, or downwards in the palate.

The most prominent symptom, however, is chronic unilateral purulent nasal discharge. This discharge may pass forwards to make its appearance on the handkerchief, or backwards when it is swallowed, and causes an unpleasant taste. Transillumination, and puncture through the nose are valuable aids in the diagnosis.

Treatment.—In all cases of dental origin the offending tooth must be removed, and this treatment quite often ends the whole trouble. This necessary procedure leaves a tempting opening into the antrum ready to hand, through which lavage of the cavity might be

undertaken. But the temptation to make use of this means of access to the cavity must be resisted at all costs. The dangers of sepsis by which it is accompanied are sufficient to condemn the method out of hand.

On the other hand, a simple puncture through the nose will probably be required to clinch the diagnosis, and treatment can be commenced by washing out the cavity by this means. In chronic cases, however, and in some acute cases, more drastic operative measures are required. The anterior end of the inferior turbinate bone may be removed, and the inner wall of the antrum broken away, so as to leave a large, permanent intranasal opening through which lavage can be performed.

In still more obstinate cases a radical operation is required; the variety most frequently undertaken is that known as the Caldwell-Luc operation. An incision about an inch in length is made over the region of the canine fossa, at the junction of the buccal and alveolar mucous membrane. The incision is continued right down to the bone. The periosteum is then stripped off the bone, both upwards and downwards, leaving uncovered the bone composing the anterior wall of the antrum. This bony wall is then chiselled away sufficiently to admit the surgeon's finger. The cavity is carefully explored, and all pus or polypi removed. Septa behind which pus may be lodging should be broken down. As far as possible the lining membrane of the cavity should be left intact.

The cavity having been fully explored and cleansed, a large permanent opening is made in the inner wall of the antrum leading into the inferior meatus of the nose. The wound in the mucous membrane covering the canine fossa is then closed by stitches. Constant irrigation of the cavity will be subsequently required for a few days.

Tumours of the Antrum.—*Polypi* are the most common simple tumours, and should be removed; they generally occur in connection with chronic empyema (*q.v.*).

Both *carcinoma* and *sarcoma* may affect the antrum. The operative measures necessary for the removal of

malignant growths in this region are commonly very extensive.

Frontal Sinus.

The same varieties of inflammatory affections occur as have been described in dealing with diseases of the maxillary sinus.

Acute Catarrh occurs in the course of nasal catarrh, or catarrh of other sinuses, and gives rise to unilateral frontal headache, with tenderness on pressure above the eye.

Treatment.—The accompanying nasal catarrh must be dealt with. The application of Antiphlogistine or a blistering agent to the skin over the sinus constitutes most effective local treatment.

Acute Suppuration usually results from injury or extension of inflammation from the nose or neighbouring sinuses. It is characterized by a unilateral purulent nasal discharge, which may be seen to come from the opening of the infundibulum.

An attempt may be made to pass a probe into the cavity through the infundibulum. This is an operation which requires considerable experience and skill. It is rendered somewhat easier by the removal of the anterior end of the inferior turbinate. Lavage of the cavity has been carried out through the infundibulum.

In most cases radical measures are required. The operation usually undertaken is known as Killian's operation. An opening in the anterior wall of the sinus is made through an incision in the line of the eyebrow, and the cavity irrigated.

Chronic Frontal Sinus Empyema is treated by the same methods as the acute variety.

Tumours of the Frontal Sinus—

Polypi are the most frequent simple tumours which occur. They rarely cause symptoms, and consequently escape both diagnosis and treatment.

Carcinoma and *Sarcoma* usually occur by extension from surrounding tissues.

CHAPTER XXVI.

DISEASES OF THE SALIVARY GLANDS.

Parotid Gland.

Acute Parotitis may result from injury or exposure to cold; from extension of inflammatory conditions of the mouth or teeth, such as stomatitis or alveolar abscess; or as a complication of an acute specific fever, especially typhoid or scarlet fever. The disease is characterized by a painful swelling of the gland, which is tender to pressure; there is usually some redness of the skin, and œdema of the superficial tissues covering the gland. When the inflammation progresses as far as the stage of suppuration, the pus commonly burrows deeply, as the tenseness of the superficial tissues in this region tends to prevent the abscess from pointing immediately over the gland.

Severe constitutional disturbance often accompanies the condition.

Treatment.—In the early stages, fomentations should be applied. When suppuration occurs, the pus should be evacuated by operation. The incision should be so planned that the least possible injury be done to the branches of the facial nerve.

Chronic Parotitis may follow the acute variety, or may result from the impaction of a calculus in Stenson's duct. A chronic painful swelling results, which may suppurate. The condition should be treated in the same way as the acute variety.

Epidemic Parotitis, or **Mumps,** belongs more to the domain of medicine than of surgery, and is consequently not considered here.

Tumours of the Parotid Gland.

The so-called **Parotid Tumour** is most probably an endothelioma, but the tissues of which it is composed are various. It forms a hard, firm, nodular tumour, which is painless and grows very slowly. At first it is

adherent neither to the skin nor to underlying structures, and is therefore somewhat movable, but later on it tends to become fixed. Mucoid degeneration may occur, resulting in the presence of soft areas scattered through the hard tumour. If left untreated, it tends to become malignant.

Treatment.—On account of this tendency to take on malignant characteristics, the growth should be completely removed. The operation involves difficult dissection in order to avoid injury to important structures.

Carcinomata and **Sarcomata** occur in the parotid gland. These tumours should be completely removed with the neighbouring lymphatic glands.

Wounds of Stenson's Duct are uncommon, except as the result of operative procedure. The severed ends of the duct should, if possible, be sutured together. If this cannot be done, an incision should be made, through the buccal mucous membrane, and the upper end of the duct (that is, the end nearest the gland) sutured to the margins of this incision, so that the salivary fistula, when formed, may open into the mouth and not towards the exterior.

Salivary fistula is fairly common in connection with Stenson's duct, but rarely affects the other salivary glands or ducts. It may result from a wound (operative, as a rule) or destruction by disease. A small opening is formed, from which saliva is discharged, this discharge being naturally increased at meal-times. Ingenious operative measures have been devised by which the fistula may be made to discharge into the buccal cavity, instead of externally.

Submaxillary Gland.

The inflammatory affections of the submaxillary gland are similar to those which affect the parotid, and result from similar causes. Submaxillary mumps is extremely rare.

Tumours of the submaxillary gland are rare.

CHAPTER XXVII.

DISEASES OF THE LARYNX.

Acute Laryngitis may result from a great variety of causes, of which the following are the most important:—

(1) By extension of inflammation from the nose or nasopharynx in catarrh of these regions.

(2) During the course of an acute specific fever (*e.g.*, influenza, measles, small-pox, &c.).

(3) From trauma (*e.g.*, a foreign body or a scald).

(4) From the inhalation of irritant fumes (*e.g.*, tobacco smoke, bromine, &c.).

(5) From over-use of the voice, in singing or public speaking.

The disease commences with dryness and irritation in the larynx, accompanied by a dry cough. Later on, clear mucus is coughed up which may become muco-purulent. Hoarseness is usually a prominent symptom, while there may be some pain in deglutition. In severe cases, especially in children, dyspnœa may occur, and may become urgent.

On laryngoscopic examination, which is very difficult to any but those constantly practising it, the vocal cords and surrounding mucous membrane will be found to be swollen and hyperæmic: the epiglottis also may be similarly affected.

Treatment.—Any of the irritant causes mentioned above must be removed, if present. Absolute rest is an essential in the treatment. The patient should be kept in bed, and absolutely forbidden to use his voice in any way. Steam from a bronchitis kettle, to which tinct. benzoinæ co. ʒi has been added, may give relief; or the same quantity of the compound tincture may be added to boiling water and inhaled direct. A cold compress applied to the throat may be of value. Saline purges should be given as required, and a light diet, chiefly consisting of milk, is suitable. A simple expectorant mixture should be prescribed for the cough, such as the following:—

℞. Liq. ammon. acetat. ... ʒii.
Vin. ipecac. ʒss.
Syr. tolut. ʒi.
Aq. chloroformi ad. ʒi.
Fiat mist.
Sig. ʒi. three times a day.

In the case of children, in whom dyspnœa is urgent, an emetic should be administered. For this purpose, vin. ipecac. ʒi may be given two or three times at intervals of an hour or less, until emesis results. In very severe cases, it may be necessary to perform tracheotomy.

Chronic Laryngitis occurs in various forms. It may follow an acute attack, especially if several previous acute attacks have occurred. Any of the causes mentioned under acute laryngitis may, if acting less violently but for a prolonged period, result in the chronic form. Especially is this the case with over-use of the voice, or excessive tobacco smoking. Nasal obstruction, *e.g.*, from enlarged tonsils and adenoids, is another cause of the condition. Similar symptoms are present as in the acute variety. The hoarseness is a more prominent symptom in chronic than acute cases.

Treatment.—Any discoverable cause must be removed. All sources of irritation must be discontinued at least temporarily, such as smoking, &c. Absolute rest of the voice must be enjoined. This rest may have to be prolonged for a considerable time. Inhalations of tinct. benzoinæ co. ʒi ad. Oi, or of ammon. chloride (*see* p. 180) may be useful. Astringents may be applied to the larynx, after spraying with cocaine; zinc chloride gr. x ad. ʒi, or silver nitrate gr. xx ad. ʒi are most frequently employed for this purpose. The strength of the solutions may be gradually increased.

Singer's Nodes are a form of chronic laryngitis characterized by the presence of little hard nodules on the vocal cords, which interfere considerably with the use of the voice both for singing and speaking. Prolonged rest may cure them. If the patient cannot undergo this prolonged period of silence, the nodules may be cocainized, and removed with forceps; this treatment results in permanent impairment of the voice.

CHAPTER XXVIII.

CERTAIN DISEASES OF NECK.

Torticollis, or **Wryneck,** is a condition in which shortening or over-action of one sternomastoid muscle occurs; the corresponding trapezius muscle and the deep fascia are sometimes involved as well. The condition may result from some cause in the muscle itself or its nerve supply; or the over-action of one muscle may depend on weakness or paralysis of its opponent.

The head is drawn towards the shoulder on the affected side, while the face is turned in the direction of the sound side. The following varieties of Torticollis are described:—

Congenital Torticollis results from injury either *in utero* or during delivery. Shortening of the affected sternomastoid occurs, some of the muscle fibres being replaced by fibrous tissue.

Treatment.—Massage and manipulation are usually given a trial first, but in most cases without success. The affected muscle must then be divided by operation, and the head fixed in correct position by some apparatus in order to avoid subsequent contraction.

Acquired Torticollis may result from affection in the muscle itself or its nerve supply, or from hysteria.

The chief causes in the muscle itself are:—

(1) Exposure to cold, &c., resulting in temporary torticollis or *stiff-neck*. This should be treated by the administration of aspirin or sodium salicylate (gr. xv); a useful local application is Antiphlogistine.

(2) Cicatricial contraction in the muscle following some chronic inflammation, *e.g.*, gumma.

The treatment is the same as that recommended for the congenital variety. If the cause of the contraction is a gumma, antisyphilitic remedies should be given.

Nervous causes may be peripheral or central. Irritation of the spinal accessory nerve from disease in its neighbourhood, such as caries of the spine or enlarged

cervical glands, may result in torticollis, either tonic or clonic in type.

Central lesions such as a neoplasm or cerebral hæmorrhage may cause irritation, and result in a clonic torticollis.

Treatment must be directed towards the removal of the cause.

Paralytic Torticollis is the variety which results from weakness or paralysis of one muscle, with consequent overaction of its opponent. The treatment will depend upon the nature and cause of the muscular paralysis; this subject is medical rather than surgical, and further description is therefore omitted.

Tuberculosis of Cervical Vertebræ (*Spinal Caries. Pott's Disease*).—The etiology and pathology of this condition do not differ in essentials from the descriptions previously given in discussing the disease in general (Chapter XII) and the manifestations of the malady in bone (p. 134).

The disease usually begins in the vertebral body, just at its junction with the epiphysis; but any part of the vertebra may be the starting point. The occipito-atlantal or atlanto-axial joints are fairly frequent positions for the disease to start.

From its point of commencement, the disease spreads upwards and downwards to involve neighbouring vertebræ. Owing to the destruction of bone due to the malady, spinal curvature, usually antero-posterior, results.

Clinical Signs:—

(*a*) *Pain* may be of two kinds:—

(1) A *local* aching pain, often brought out by pressure on the top of the head.

(2) *Referred pain* due to involvement of the roots of cervical nerves, and referred to the cutaneous area supplied by the affected nerves.

(*b*) *Rigidity* of the spine is an early and valuable sign. In the early stages, it is produced by muscular action, the muscles because of the pain involved, instinctively endeavouring to limit movement in the part.

At a much later stage, if the disease has progressed favourably, and recovery is in sight, *ankylosis* may occur, and result in rigidity.

(*c*) *Curvature* of the spine is not as a rule a marked

feature, when the disease affects the cervical region. Slight deformity, however, may be detected, with compensatory curvatures in the dorsal and lumbar region.

Retropharyngeal abscess is a fairly frequent complication of cervical caries. Such an abscess may discharge into the pharynx, point in the neck, or track deeply for a considerable distance before reaching the surface. In these latter cases, the necessary evacuation of the pus is a matter of great difficulty. For information regarding the complications which may ensue from involvement of the spinal cord, a text-book on medicine should be consulted.

The diagnosis of cervical caries is, as a rule, fairly simple, when pain, rigidity and deformity are present. In very early stages, when there is no deformity, the rigidity is the most valuable sign. A skiagram is often of great assistance.

Treatment.—General treatment in accordance with the principles already laid down (Chapter XII) should be carried out.

Absolute immobility of the diseased portion of the spine must be insured by suitable apparatus. The spine will have to be kept immobile for six months at the least, and in all probability for a good deal longer.

Abscesses should be dealt with by operation. They are usually very slow in healing.

Diseases and tumours of the *thyroid* (*Bronchocele*) are treated in Chapter XI.

CHAPTER XXIX.

DISEASES OF THE EYE.

Conjunctivitis.

Many varieties of inflammation of the conjunctiva are met with, of which only a few of the more important call for mention here.

Simple Hyperæmia of the conjunctiva may occur as a transitory condition resulting from the presence of a foreign body in the conjunctival sac. There is some congestion of the conjunctiva, and the secretion of tears is increased. On the removal of the foreign body the condition rapidly clears up.

A more chronic form of hyperæmia results from chronic irritation, such as continued exposure to a strong light, or to a dusty atmosphere; from uncorrected errors of refraction; or from certain general conditions, of which gout is the most important. Both eyes are usually affected. A unilateral simple conjunctivitis is usually the result either of a foreign body in the eye, or of some blockage of the lachrymal duct.

The patient complains of tiredness of the eyes with slight photophobia (literally, dread of the light), while the lachrymal secretion is increased. These symptoms are specially noticed after prolonged use. In cases due to errors of refraction, frontal headache is often a prominent feature, while in gouty cases, there may be œdema of the conjunctiva (chemosis).

Treatment.—The cause must first be dealt with. Any possible source of irritation must be removed; the lachrymal duct must be rendered patent by the passage of a probe, if it be blocked; and any errors of refraction dealt with by suitable glasses. The conjunctival sac may be washed out with warm boracic acid lotion gr. v ad. ℥i.

Mucopurulent Conjunctivitis is due to bacterial infection. In many cases, the organism responsible is a slender Gram-negative rod known as *Koch-Weeks*

bacillus. In other cases the *Pneumococcus*, *Staphylococcus aureus*, &c., may be found. The condition is contagious, and consequently frequently transmitted.

The patient complains of a feeling of heat and grittiness in the eye, with some photophobia. The discharge is at first watery but soon becomes mucopurulent. The palpebral conjunctiva is red and congested, the bulbar conjunctiva being less affected. Both eyes are generally involved. Sometimes small ulcers occur on the conjunctiva, accompanied by blepharospasm (spasm of the lids). If a corneal abrasion is present, serious complications such as iritis (*q.v.*) may supervene.

Treatment.—The eyes must be frequently washed out with lot. hydrarg. perchlor. 1 in 5,000 diluted with an equal quantity of hot water, which makes the lotion warm and reduces its strength to 1 in 10,000.

Zinc sulphate gr. ii ad. ℥i or zinc chloride gr. i ad. ℥i may be substituted for the perchloride lotion.

This lavage must be carried out with the utmost care, in order that the cornea be not injured.

Do not bandage the eyes. This is extremely important, as fresh air is of great value in the treatment. The patient must be out of doors as much as possible. If photophobia is troublesome, dark glasses may be worn, but on no account must the eyes be bandaged.

If there is any sign of iritis, or if a corneal ulcer be present, a small quantity of atropine (1 drop of a ½ per cent. solution) should be instilled daily.

When the disease has almost disappeared, the inside of the lids may be painted with silver nitrate gr. x ad. ℥i; one application should be sufficient.

Purulent Conjunctivitis.—In the great majority of cases, the *Gonococcus* is the organism responsible for this condition. More rarely, staphylococcal, streptococcal, or pneumococcal purulent conjunctivitis occurs. The gonorrhœal variety affects newly-born children, or adults.

When it affects newly-born children, the disease is often called *Ophthalmia neonatorum*. Infection may occur during delivery, while the child's head is passing from the uterus to the vulva, or after delivery from want of cleanliness. The disease usually manifests itself about three days after birth. The lids are red,

hot, and œdematous; chemosis is usually present. The pre-auricular gland is commonly enlarged; in adults there is considerable pain. The discharge is serous at first; in three or four days it becomes definitely purulent. The purulent discharge lasts as a rule from five to six weeks.

An ulcer of the cornea may complicate gonorrhœal conjunctivitis; this grave complication may follow an injury to the cornea either from the finger nail or the nozzle of a syringe used for lavage; or the interference with the blood-supply resulting from the chemosis may be responsible for the ulceration. Corneal ulceration and its possible sequelæ are briefly discussed on p. 217.

Treatment.—In children *prophylaxis* is of the first importance. The moment a child is born, or even in the short interval which usually occurs between the birth of the head and the remainder of the body, the child's eyes should be gently but carefully wiped out with cotton wool. Then, after delivery, a drop of silver nitrate solution gr. x ad. ℥i should be instilled into each eye. The mother and her attendants must be impressed with the importance of cleanliness in respect of handkerchiefs or towels used to wipe the child's eyes subsequently.

When the disease first makes its appearance, it is unilateral as a rule, but very prone to spread to the other eye from direct infection. The first point in the treatment, therefore, is to protect the sound eye as far as possible. Special protective shields called *Buller's shields* are used for this purpose.

The diseased eye must be frequently irrigated with 1 in 5,000 perchloride lotion. Syringes should not be used, for fear of some damage to the cornea resulting. Silver nitrate gr. xv ad. ℥i may be painted on in the early stages, if no perforation has occurred. Atropin is not required for the conjunctivitis itself, but if corneal ulceration occurs, the pupil should be kept just dilated with atropin, to ward off iritis if possible.

In adults the urethral condition must be treated at the same time (*see* p. 88).

Many other types of conjunctivitis occur, of which a bare mention will suffice.

Membranous Conjunctivitis may be diphtheritic, but is not invariably so. It should be treated as a purulent

conjunctivitis. In cases due to the *Klebs-Loeffler bacillus*, diphtheria antitoxin should be employed. It may be used locally as drops, in addition to the subcutaneous injection.

Phlyctenular Conjunctivitis.—One or more little yellowish nodules make their appearance on the bulbar conjunctiva, just outside the limbus. These are called *phlyctens*. Several vessels are seen running up to the phlycten. A mucopurulent conjunctivitis is usually present also. Ulceration at the top of the phlycten followed by necrosis may occur, which, if it spreads over the cornea, results in a permanent opacity.

Phlyctens occur chiefly in children of the tubercular or strumous type. Adenoids, enlarged glands, &c., are often present.

Treatment.—Lavage with perchloride lotion, combined with the use of atropine, sums up the treatment. The eye should not be tied up, and the child should get out in the fresh air as much as possible.

Granular Conjunctivitis occurs in two forms:—

(1) Follicular conjunctivitis.

(2) Trachoma.

Follicular Conjunctivitis.—Small granulations, about the size of a pin's head, make their appearance inside the lower lid. The granulations are pale and translucent, and are arranged in regular rows. They never ulcerate, and do not involve the cornea. They occur in strumous children, and are often of the nature of adenoid growths. The disease is not of any great importance in itself, but requires to be distinguished from trachoma, which is a very grave condition.

Trachoma is an extremely contagious disease, occurring in the children of the poor, and closely associated with the dirty conditions of life which are almost inseparable from overcrowding. No specific organism has as yet been isolated. The disease commences as a typical mucopurulent conjunctivitis (*q.v.*). Later, slight ptosis (drooping of the upper lid) occurs, and on examination, granulations will be found on the palpebral conjunctiva of both lids, the upper fornices being chiefly affected. The bulbar conjunctiva is rarely involved.

The upper half of the cornea is hazy, and superficial vessels are present in it. This condition of the cornea

is known as *Trachomatous pannus*. The pannus may completely disappear without leaving a scar, but in some cases, permanent opacity results.

Corneal ulceration with its sequelæ frequently supervenes.

Treatment.—Prophylactic treatment by careful and constant inspection of schools, and immediate isolation of every individual case discovered, is of great importance. When the disease has obtained a footing, the patient must be isolated. The malady is very chronic, and treatment may be required for a year or more.

In the early stages constant washing out must be performed, and the lids painted daily with silver nitrate gr. x ad. ℥i.

Later on, cauterization of the follicles with solid copper sulphate is required. This must be carried out thoroughly every day, special attention being paid to the fornices. It is extremely painful to the patient. When the granulations are very large they may be expressed by means of special forceps (*Grady's forceps*).

Iritis.

Inflammation of the iris (*iritis*) is always associated with more or less inflammation of the ciliary body (*cyclitis*). The condition should therefore strictly be called *iridocyclitis;* but it is usually spoken of simply as iritis.

Iritis may result from corneal inflammation following conjunctivitis; from injury; or from certain general conditions, notably gout, rheumatism, and perhaps syphilis or tuberculosis. In cases of severe injury to one eye, *sympathetic iridocyclitis* may supervene in the second eye. This is a very serious condition, almost always resulting in loss of the eye.

The chief symptoms and signs of iritis are as follows:—

(1) *Pain* which comes on in exacerbations, and is worse at night.

(2) *Photophobia.*

(3) A sense of "wateriness" but no actual discharge.

(4) *Engorgement* of radiating vessels around the cornea.

(5) *Contraction* and *irregularity* of the *pupil.*
(6) *Deepening* of the *anterior chamber.*

Treatment.—Rest and atropin are the two chief points in the treatment. *Both eyes* should be completely rested, and protected with dark glasses. When possible, the patient should be kept in bed in a darkened room.

Atropin should be instilled, one drop of a 1 per cent. solution being used six times a day. Bathing the eye with hot boracic lotion may give relief to the pain; when pain is a very severe symptom, a leech may be applied to the temple. In acute cases immediate treatment on these lines may cure the condition in from two to four weeks. In severe cases, or when treatment has not been immediate, the inflammatory exudates may become organized into fibrous tissue. The pupil may thus be fixed to the lens.

In more chronic cases, where the cyclitis is marked, misty vision and floating opacities in the vitreous are frequent features. *Keratitis punctata* is the name given to a triangular patch of dots, on the back of the cornea at its lower part. This condition is diagnostic of cyclitis, the dots being the remains of exudates.

Glaucoma is a condition in which the intraocular tension is raised. This may be due either to an increased formation of fluid or to a blocking of the exit for the fluid. It is important to diagnose between this condition and iritis, as the treatment of the two is entirely different. In *iritis*, the pupil is small and irregular, and the correct treatment is to take measures to dilate it (*i.e.*, with atropine). In *glaucoma*, the pupil is large and regular. This may serve to remind the student that measures which will result in dilatation of pupil are absolutely contra-indicated, as the consequence of such treatment would be a further increase in the tension. Atropin, therefore, is required in iritis, and absolutely dangerous in glaucoma. It will thus be seen that a correct diagnosis is essential. A further difficulty arises from the fact that the exudates poured out in iridocyclitis may interfere with the exit of fluid and so actually induce glaucoma. When the two conditions are present at the same time, the greatest experience is required to

decide upon the appropriate treatment; and the student who desires further information upon this point should consult a text-book specially devoted to ophthalmology.

The following table may serve to impress upon the reader the chief points of difference between the two conditions: —

Iritis.	Glaucoma.
Pupil small.	Pupil large.
,, irregular.	,, regular and oval.
Intraocular tension normal (it may be slightly raised in chronic cases).	Intraocular tension raised.
Anterior chamber deep.	Anterior chamber shallow.

Keratitis.

The chief importance of inflammation of the cornea lies in subsequent interference with vision resulting from the permanent opacities which almost invariably follow.

Ulcerative Keratitis most commonly results from infection after some slight injury, such as a scratch from a particle of dust. Trachoma and other forms of conjunctivitis may also result in corneal ulceration. Very superficial ulcers, which do not destroy Bowman's membrane, heal without leaving any scar. When Bowman's membrane is involved, which is almost always the case, a permanent scar always remains. These opacities are given different names, according to their density, which depends upon the depth to which the ulcer penetrates. A very thin scar is called a *nebula;* a *macula* is a somewhat denser opacity; while a thick, white, opaque patch is known as a *leukoma.* The interference with vision due to an opacity depends upon the area and position of that opacity as well as its thickness.

Localized inflammation and destruction of the superficial layers of the cornea occur, forming a somewhat saucer-shaped ulcer. Vascularization of the cornea follows as the ulcer heals. Even if there is not complete perforation, some iritis is usually present. The symptoms of corneal ulceration are pain, lachrymation, blepharospasm and photophobia.

The treatment of a simple ulcer includes irrigation with warm boracic lotion, and the use of one drop of

½ per cent. atropin three times a day as a precaution against iritis. *The eye should be bandaged.*

The chief complications which occur are:—

(1) **Perforation.**—When perforation occurs, the aqueous humour escapes, the iris and anterior surface of the lens therefore being in contact with the posterior surface of the cornea. Part of the iris may pass through the perforation; this is known as *prolapse* of the iris. The lens may adhere to the cornea and this will result in a permanent opacity on the anterior surface of the lens, which is known as an *anterior capsular cataract.* Virulent organisms may gain access to the interior of the eye through the perforation, resulting in infective iridocyclitis; or even an infective inflammation of the whole eye, which is called *panophthalmitis.*

(2) **Hypopyon** is a collecton of pus at the bottom of the anterior chamber. This may occur without perforation, being then composed simply of exudates from the iritis which is usually present: the hypopyon in such a case is sterile.

If perforation occurs, the hypopyon necessarily becomes infected.

Treatment.—A deep ulcer, which has not perforated, should first be stained with fluorescin (which stains the ulcer yellow, and does not affect the remainder of the cornea); the base of the ulcer should then be cauterized with pure carbolic acid, cocaine having been previously instilled. The eye should then be tied up, and the patient kept quiet in bed in order, if possible, to avoid perforation.

When the ulcer is so deep that perforation seems inevitable, it may be wise to perform *paracentesis;* that is, to incise the cornea with a special needle, so that the aqueous may be allowed to escape less suddenly than would have been the case had the ulcer been left to perforate in the ordinary way.

When perforation has occurred, the patient must be kept absolutely still, all coughing and sneezing being avoided where possible. Atropin should be instilled, as for iritis, and the eye firmly bandaged. If prolapse of the iris occurs, the prolapsed portion should be excised.

If such a condition as panophthalmitis arises, excision of the eyeball will usually be required.

Interstitial Keratitis is an important manifestation of congenital syphilis. It occurs between the ages of 5 and 15, and is really a keratitis which is secondary to iridocyclitis. Both eyes are affected, but usually one later than the other.

At first, there are symptoms of irritation in the eye, with slight ciliary congestion. Then hazy patches appear which are situated deep in the cornea. At a later period, the whole cornea is "steamy," and vascularization of the cornea occurs. The newly-formed leashes of vessels, showing through the steamy cornea, give rise to typical pinkish patches, known as *salmon patches*. Vision is interfered with considerably, while blepharospasm and photophobia are marked features.

Treatment.—Antisyphilitic remedies appear to have no effect. Atropin should be given for the iritis; dark glasses should be used.

Fine lines remain permanently where the corneal vessels existed; this is important evidence of congenital syphilis.

Ptosis, or drooping of the upper lid, may be congenital or acquired.

Congenital Ptosis is almost always bilateral, and most often due to imperfect development of the levator palpebræ superioris; in rare cases it may result from cerebral mal-development.

Acquired Ptosis is usually unilateral, and may result from a lesion in the central nervous system (in which case it is associated with paralysis of other muscles supplied by the third cranial nerve), or from injury. In rare cases, it is due to increased weight of the lid.

Treatment necessarily depends on the cause. Operative measures have been devised, but the results have not been encouraging.

Strabismus, or **Squint**—

Strabismus may be of three kinds:—

(1) *Paralytic Strabismus*, due to paralysis of one or more eye muscles.

(2) *Kinetic Strabismus*, due to overaction of one or more eye muscles.

(3) *Concomitant Strabismus*, the cause of which is unknown.

(1) **Paralytic Strabismus.**—There exists limitation of movement in the direction in which the affected muscle should act. The chief symptom experienced by the patient is *diplopia*, most marked in the slight cases.

Treatment will depend upon the nature of the lesion to which the paralysis is due. Syphilitic cases may improve on anti-syphilitic treatment.

Operative measures, such as tenotomy of the opposing muscle, may be of value.

(2) **Kinetic Strabismus** is mostly the result of irritation of the cerebral centres by tumours, meningitis, &c.

(3) **Concomitant Strabismus** is thus described by Parsons: "The visual axes, though abnormally directed, retain their abnormal relationship to each other in all movements of the eyes."

The condition usually begins in childhood, and is frequently associated with errors of refraction. The treatment, therefore, involves the correction of these errors of refraction.

CHAPTER XXX.

DISEASES OF THE SKIN.

The subject of skin disease will be treated in strict accordance with the requirements of the examinations for the various dental diplomas and degrees, and the reader will understand that these limitations are obligatory from considerations of space.

A Wart is a papilloma of the skin. It most frequently attracts notice as a hard growth, about the size of a pea. It is most common in young people, the hands being usually affected. The surface of the growth may be smooth or papillated. In moist regions, the growths may become much softer in character. They are generally multiple, and usually follow some chronic irritation.

Warts are best treated by cauterization with acetic or nitric acid. Carbon dioxide snow has been used with success.

A Corn may be *hard* or *soft*.

A *hard corn* is a horny growth of the epidermis, which occurs in positions subjected to undue irritation, especially the toes, and is usually single. It is often a source of considerable pain.

A hard corn may be treated by paring with a razor after immersion in hot water. The source of irritation should be removed, and the situation of the lesion protected from pressure.

The following prescription, painted on the corn three times a day for a week, may be very useful: —

℞	Acid. salicyl.	gr. xv.
	Extr. cannabis indicæ	gr. viii.
	Spir. vini rect.	m. 15.
	Æther	m. 40.
	Collodii	m. 75.

Fiat pigmentum.

In the obstinate cases it may be necessary to amputate the affected toe.

Soft corns occur most commonly between the toes.

They are smaller than hard corns, and usually multiple. They should be treated with salicylic acid to remove the cuticle; and vaseline or cottonwool soaked in boracic acid lotion should be placed between the toes to avoid subsequent irritation.

A Keloid is a growth composed of fibrous or scar tissue. In the great majority of cases it arises in a scar, but is said also to occur spontaneously. The cause has not been definitely determined, but it is supposed to be infective in origin. It grows slowly, but may attain very large dimensions. If removed, it almost invariably recurs in the scar. Operative treatment is therefore rarely successful. Both X-rays and radium have been employed with benefit in some cases.

A Rodent Ulcer is a carcinomatous condition of the skin, which differs from an epithelioma both in its origin and clinical course. Opinions are divided as to whether it originates from a sebaceous gland or a hair follicle, but it seems clear that it is not a down growth from the epithelium (*cf.* Epithelioma).

The growth is rare except on the face, the side of the nose near the inner canthus being the most frequent situation.

It commences as a small, hard, flat nodule, in which after a varying period ulceration takes place. The ulcer thus formed is flat, irregular, and of an unhealthy appearance; the edges are usually slightly raised and indurated.

The ulcer increases in size very slowly, often remaining apparently stationary for months at a time. It is very destructive in character, even the bone being attacked. The glands are not involved, and no secondary deposits are formed. Cachexia is rare, except in the last stages. Microscopically, the growth will be found to be composed of columns of epithelial cells embedded in fibrous tissue. The individual cells are smaller than in epithelioma; prickle cells do not occur, and cell nests are rarely seen.

The diagnosis is not usually difficult, when the position, appearance, and slow growth are considered (*vide* Lupus, p. 223).

Treatment.—X-rays and radium have been employed, and in the early stages are often of great value.

Operative treatment consists in free excision; or

where this for anatomical reasons is impossible, free scraping and application of the actual cautery.

Carcinoma of the skin may occur (either primary or secondary). Secondary deposits of *sarcoma* also occur. Primary sarcoma of the skin is rare.

Lupus vulgaris is a chronic affection of the skin, due to the activity of the tubercle bacillus. It commonly occurs on the face, a frequent situation for the disease to commence being behind the ala of the nose, at its junction with the cheek. It usually begins during childhood, but being a very chronic malady, is often met with in later life.

Symptoms.—The first sign of the condition is usually the appearance of one or more dull-red spots about the size of a pin's head, which are most commonly slightly raised above the level of the skin. They do not disappear on pressure, though they become considerably paler. As the spots increase in size, they show a brownish colour and a peculiar translucent appearance, which has earned them the name of *Apple jelly nodules*. They feel rather like small shot under the skin. Slowly they increase in size, two or more nodules frequently coalescing to form one larger patch. As the patches increase in size scales form on the surface.

Though its progress is very slow, lupus is very destructive, all the soft parts being liable to attack; the bones, however, very rarely suffer. The disease does not progress continuously, but often appears to improve for a time, only to advance once more.

In the later stages ulceration may occur, especially if mucous membranes are involved, the surface being covered with greenish crusts, from which thin purulent fluid is discharged.

The diagnosis in a typical case is easy. *Syphilitic* affections progress more rapidly, as a rule, and commonly commence in adult life. Ulceration occurs more readily than in lupus. *Epithelioma* will not, as a rule, be mistaken for lupus; its hard everted edge, the pain caused, and the tendency to involve neighbouring glands are important points in the diagnosis. It must not be forgotten that the two conditions may be met with together, because the epithelioma may form in the lupus scar tissue.

A *rodent ulcer* is very rarely multiple, and very rarely is there more than a slight amount of discharge. It commonly begins at a much more advanced age than does lupus.

Treatment.—Very varied methods of treatment have been suggested for dealing with this disease. Ordinary measures must be taken to support the general health, as has been described in dealing with all the manifestations of tuberculosis.

Extr. thyroidei may be given internally, commencing with gr. v during the day, the dose being gradually increased to gr. xv, or even gr. xx in the twenty-four hours.

Tuberculin injections rarely appear to have more than temporary effect.

Excision may be of great value, especially in quite early stages. When the disease affects the face, it may be difficult to obtain the patient's consent to this operation. The actual cautery has also been employed.

Great improvement may be obtained from the use of the *Finsen light* treatment. Radium and X-rays have also been used. The details of these methods are outside the scope of this handbook.

Local applications are mostly used simply to render the part aseptic. Such preparations as ung. acidi bor. are useful. Caustic drugs are rarely used nowadays, as they involve more pain than the other methods described.

Acne Vulgaris is an inflammation of the sebaceous glands, due to blocking of their ducts. It affects chiefly boys from about 15 to 25 years old. It is certainly micro-organic in origin, but opinions are divided as to the particular organism present. In all probability there are several bacteria which may produce the condition.

The individual *comedo* begins as a red papule, often very tender, and surrounded by a zone of hyperæmic skin. It soon becomes pustular; it often has a central black spot. Large acne spots often leave scars.

The common situations for the disease are the back and shoulders, and less frequently the chest, face, neck and buttocks.

There are many conditions which predispose to the

disease. Any mechanical blockage of the duct, *e.g.*, by dirt, may bring on an attack. Also general disturbances, such as constipation, debility, and menstrual disorders render a patient more liable to the disease.

Diagnosis is very easy from the age of patient, and position and appearance of the lesion. The possibility of a drug rash, such as bromide, &c., must be borne in mind in making a diagnosis.

Treatment.—General hygiene treatment must be employed, and any of the predisposing causes mentioned above dealt with if present.

Local treatment by incising the individual pustules *with a clean instrument*, squeezing out the pus, and applying sulphur ointment is usually sufficient.

In very obstinate cases, vaccines, prepared from the particular micro-organism present in the case, may be employed, often with great benefit.

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